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Part II

# Department of Energy

## Office of Conservation and Renewable Energy

## Federal Energy Management and Planning Programs; Methodology and Procedures for Life Cycle Cost Analyses (Average Fuel Costs)

DEPARTMENT OF ENERGY

Office of Conservation and Renewable Energy

10 CFR Part 436

[Docket No. CAS-RM-79-107]

# Federal Energy Management and Planning Programs; Methodology and Procedures for Life Cycle Cost Analyses (Average Fuel Costs)

AGENCY: Department of Energy.

ACTION: Final rule.

SUMMARY: The Department of Energy (DOE) is issuing a final rule to amend Subpart A of 10 CFR Part 436, which contains the methodology and procedures for use in conducting life cycle cost analyses. The analyses involve an examination of the estimated cost effects of investments in existing and new Federal buildings to minimize building energy use or to employ building systems which rely on renewable energy resources. DOE is updating the methodology's energy price projections, modifying the discount rate and the study period, and making minor technical corrections.

EFFECTIVE DATE: November 18, 1981.

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SUPPLEMENTAL INFORMATION:

## I. Introduction

The Department of Energy (DOE) today promulgates amendments to Subpart A of Part 436 in Title 10 of the Code of Federal Regulations (10 CFR Part 436) which sets forth a rule prescribing the methodology and procedures for estimating and comparing the life-cycle costs of investments to conserve energy or to increase the use of renewable energy resources in existing and new Federal buildings. Subpart A was originally published in a notice of final rulemaking on January 23, 1980 (45 FR 5620) pursuant to section 381(a)(2) of the Energy Policy and Conservation Act as amended, 42 U.S.C. 6361(a)(2), section 10 of Executive Order 11912 as amended by Executive Order 12003, 42 FR 37523 (July 20, 1977), and Title V, Part 3, of the National Energy Conservation Policy Act (NECPA), 42 U.S.C. 8255.

The methodology required by Subpart A involves a systematic analysis of all the significant cost savings and costs associated with energy investments. The methodology relates the initial costs of an energy investment to the future cost savings and costs associated with that investment, and in § 436.14 it provides for standardized assumptions to establish and compare the relevant costs. Among other things, § 436.14 provided for Federal agencies to assume a real discount rate of 10 percent, a maximum study period for life cycle cost analysis of 30 years, and energy cost escalation rates and 1980 base year energy prices, both of which were based on DOE projected average energy costs.

The assumptions in section 436.14 have been affected by changes in law enacted as a part of the Energy Security Act (ESA), (Pub. L. 96-294). Section 405 of the ESA amended section 545 of the NECPA by requiring that the methodology be based on a 7-percent real discount rate, a 25-year maximum study period, and "marginal fuel costs." Today's final rule makes the required changes in the discount rate and the study period. It also updates the average base year prices and escalation rates for interim use while work continues on development of marginal fuel cost projections. Marginal fuel costs are to be the subject of a separate rulemaking. The rulemaking completed today began on October 7, 1980, with a Notice of Proposed Rulemaking (NOPR) (45 FR 66632). On October 27, 1980, DOE published a correction to the proposed rule and extended the comment period accordingly (45 FR 71326).

## II. Discussion of Comments and Other Issues Related to Amendments of the Rule

### *A. Discount Rate*

For the purpose of calculating the present worth of future cost savings and costs, the existing rule provided for a "real" 10-percent discount rate, that is, a rate not including inflation. In response to the change in law enacted as part of the ESA, the proposed rule provided for a change in the discount rate to 7 percent.

A number of comments were received concerning the proposed change. One comment argued that future cost savings would still be discounted too heavily if real discount rate were 7 percent. Two others suggested the desirability of publishing additional Uniform Present Worth (UPW) tables reflecting different discount values so that entities other than Federal agencies could use the methodology and so that a Federal agency could analyze investments in increased energy efficiency in activities other than operation of buildings.

DOE decided not to make any changes in the proposed rule based on these comments. DOE cannot alter the discount rate for Federal buildings because it was fixed by law in the ESA. With respect to requests for tables of present worth factors reflecting other discount rates, DOE decided that it was inappropriate to add appendices which are not necessary for analysis of investments in Federal buildings and might be confusing to Federal agencies. DOE will consider the inclusion of such tables when updating parts of the "Life Cycle Cost Manual for the Federal Energy Management Program" (which gives a step-by-step explanation of how to perform a life cycle cost analysis under the rule). These tables would be purely informational for those who wish to adapt the methodology for analysis of investments other than in Federal buildings.

### *B. Study Period*

No comments were received on the proposed amendments related to the reduction of the maximum study period for analysis from 30 years to 25 years as required by the ESA. Accordingly, DOE promulgates the proposed amendments without change.

### *C. Updated Base Year Prices and Escalation Rates*

Section 436.14(c) of the rule provided for Federal agencies to assume DOE-projected base year energy prices for the appropriate region, sector, and fuel type in Appendix C, except that the agencies were authorized to use their actual prices if they were higher or reflective of peak and off-peak pricing by the energy supplier. In practice, most agencies had somewhat higher actual 1980 prices, and few if any used the DOE-projected prices or had available peak and off-peak prices.

Section 436.14(b) provided for Federal agencies to assume that energy prices escalated over time at real rates (exclusive of increases in the general level of prices in the economy) set forth in Appendix C. The rule did not provide for any exception to this assumption. The escalation rates were derived from comparison of prices for 1980, 1985, 1990, and 1995. DOE projected 1980 prices through a primarily "econometric" model which is based on current price

data and trends, as modified by the short term effect of changes in several variables including world oil prices, heating and cooling degree days, and disposable income. The 1985, 1990, and 1995 prices were projected independently using a model which is structural in nature and directly models functions relating to the extracting, transportation, and conversion of fuels, as well as those functions relating to the long term effects of supply and demand interactions (see 1 below). It should be noted that the rule does not provide for direct use of the 1985, 1990, and 1995 price projections in life cycle cost analyses. The rule only provides for direct use of the escalation rates which are based upon those projections.

The notice of proposed 1981 base year energy prices and updated energy cost escalation rates stimulated a wide variety of comments. Some comments criticized the use of a "structural" model to project prices and questioned DOE's ability to forecast energy prices accurately. Other comments attacked the reasonableness of some or all of the projected prices. Still others requested DOE projections of peak and off-peak prices. Most of the comments were concerned with certain assumptions underlying the computer model used to project energy prices in 1985, 1990, and 1995.

*1. Using a "Structural" Model to Forecast Prices for 1985, 1990, and 1995.* As was explained in the preamble to the proposed rule, the computer model used to project prices is the Mid-Term Energy Forecasting System (MEFS). MEFS is an integrated computer model of the domestic energy system which was developed by DOE's Energy Information Administration (EIA). MEFS provides for explicit representation at the regional level of (a) the supplies of and demand for petroleum products, natural gas, and coal, (b) the costs of petroleum refining, electricity generation, and transportation, and (c) the price sensitivity of energy supplies and demands. In forecasting future energy supply, demand, and prices, MEFS simulates the interplay between a number of different variables such as economic growth, world oil prices, and the discovery of additional domestic energy resources. Through use of supply and demand curves, the MEFS model determines the equilibrium price for each energy commodity as a function of complex supply and demand interactions by all energy commodities. Because of the uncertainty of price forecasts, EIA provides a range of forecasts based on different assumptions about world oil prices and other parameters.

The comments which objected to any use of price projections questioned the ability to forecast energy prices accurately. One comment pointed out that the use of a computer model is dependent upon two important assumptions: that the world of the future will resemble closely the world of the model; and that projections used as inputs to the model are accurate. The comment further stated that both of these assumptions are not true, and as a result, energy forecasts have been inherently unreliable in predicting accurately the movements of energy prices.

DOE agrees that the problems of energy price forecasting are formidable, and that completely accurate projections may be impossible. However, forecasting future prices is indispensable to conducting life cycle cost analyses, and DOE is of the view that use of a computer model to project prices is preferable to a totally subjective guess at escalation rates and prices. DOE has attempted to make its projections as accurate as possible, within the obvious constraints imposed by the fact that international affairs and other factors can severely affect the climate in which our economy operates and that MEFS simulates. Moreover, experience has shown that the price forecasts are sufficiently accurate in most circumstances to be a reliable basis for life cycle costing.

*2. Generalized Comments on Price Projections.* Some comments, which appeared to accept the use of computer models in principle, were generally critical of the accuracy of DOE price projections. A few comments criticized individual base year price projections as too high. Others criticized the 1985, 1990, and 1995 projected prices used to generate the escalation rates in the rule as being too low.

In response to these comments, DOE has made significant changes in the rule to deemphasize the use of projected prices. DOE has reworded § 436.14(c) to provide that use of actual base year prices, an exception under the existing rule, is now the norm. DOE-projected base year prices are to be used only if actual base year prices are not readily available.

Both in response to the comments and as part of continual review and revision by EIA, DOE has also modified the 1981, 1985, 1990, and 1995 price projections and (more importantly) the escalation rates derived from them. The new projections and escalation rates are often higher than those that were proposed. Changes in the 1985, 1990, and 1995 price projections stem in part from modifications of the MEFS program which are discussed below. They also stem from the fact that the proposed rates were derived from the analyses and models used to develop the 1979 EIA *Annual Report to Congress* while this final rule is based on the 1980 report.

The difference between the proposed and final projections arises from three primary factors:

- Some scenario assumptions are changed;
- The analyses and models are modified;
- New or updated data are added.

Of these, the changes in scenario assumptions generally make the most difference. They include increased international oil prices, a reduced economic growth forecast, a change in the way the Natural Gas Policy Act implementation is modeled, a change in the way implementation of the Powerplant and Industrial Fuel Use Act is modeled, and changes in the values of the parameters that determine the capital stock decisions of major fuel-burning installations. These changes are described in some detail in the EIA 1980 *Annual Report to Congress,* Volume 3: Forecasts.

In subsuquent EIA annual reports there will be new and different methods, data, and assumptions. At the very least, these changes will reflect any new legislation. In addition, the international climate could evolve in a way that would require changes in the assumptions used in the Oil Market Simulation and the International Energy Evaluation System, from which the three international oil price scenarios are synthesized. Changes in price projections occur because the development of energy forecasts is an evolving process, driven by refinements in methods, data, and assumptions.

The projected energy prices used in this rule represent the results of price forecasts by EIA and are based on an assumption of high long-term world oil prices. The following table sets forth the high world oil price scenario and, for purposes of comparison, EIA's low and medium world oil price scenarios:

INTERNATIONAL OIL PRICE

[Mid-1981 dollars per barrel]

| | Low | Medium | High |
|---|---|---|---|
| 1990 | 38.50 | 49.25 | 59.75 |
| 1995 | 38.50 | 60.00 | 84.00 |

Other key assumptions of the EIA high energy price forecast are:

1. Real (inflation adjusted) annual growth rate for the Gross National Product (GNP) will average 3.1 percent per year from 1981 to 1985, 2.7 from 1985 to 1990, and 1.6 from 1990 to 1995.

2. The provisions of the Natural Gas Policy Act (NGPA) are fully implemented, including the Incremental Pricing provisions.

3. The provisions of the Powerplant and Industrial Fuel Use Act (FUA) are fully implemented, including the Systems Compliance Option.

4. Domestic oil prices are decontrolled in 1981.

5. There is no oil pipeline from the West Coast to central portions of the U.S.

6. A gas pipeline from Alaska is in place in 1990.

7. Proved reserves are those reported in the American Petroleum Institute/American Gas Association report entitled "Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States as of December 31, 1979."

8. Expansion of electric utility fossil fuel capacity in 1985 and 1990 is limited to announced utility plans. Expansion in 1995 is based on economic considerations.

9. Because of longer lead times, no nuclear projects beyond those currently operating, under construction, or now planned are expected to be operational by 1995.

*3. Peak and Off-Peak Prices.* Section 436.14 of the existing rule authorized Federal agencies to use base year prices reflecting actual energy pricing variations such as time-of-day charges, demand charges, and seasonal variations. Several comments suggested that DOE should provide peak and off-peak price projections. They argued that the demand and usage components of utility pricing structures should be taken into account because use of a single fuel cost could result in either an understatement or an overstatement of the cost savings of a particular conservation option.

DOE agrees that the use of peak and off-peak pricing in comparison of certain options may be a preferred method at some time in the future for performing a life-cycle analysis. At the present time, there are several time-of-day pricing experiments going on in various parts of the country, but the great preponderance of electrical billings to consumers does not distinguish between peak, intermediate, and base load usage. Consequently, it would be difficult and premature at this time to project peak and off-peak prices and escalation rates.

However, in an effort to facilitate use of actual "time variable" prices as supplied by the utility, DOE today amends section 436.14 by allowing for escalation of those prices by component-specific rates provided by the energy supplier. This change goes at least part of the way toward more effective provisions in the rule concerning peak and off-peak pricing.

*4. Constant Load Curve Profile.* Several comments questioned the assumption in MEFS that the electricity load curve for the last few years will remain unaltered in the future. Some stated in their comments that time-of-day pricing as well as seasonal pricing will induce a change in the load curve.

The MEFS load curve profile includes fixed proportions of base, intermediate, daily-peak, and seasonal-peak power requirements. Time-of-day pricing impacts are not currently incorporated.

DOE agrees that it is likely that time-of-day pricing and other load management techniques will modify the historical load curve profile. However, at the present time, there is no body of data indicating the nature and magnitude of changes in the load profile which would result from large scale implementation of load management techniques. For this reason, DOE has assumed continuation of the historical load curve profile because to do otherwise would be pure conjecture. A study of the available data is being conducted to ascertain whether a reasonable basis for projecting a revised load profile can be determined.

*5. Interregional Transfers of Electricity ("Wheeling").* Several commenters argued that MEFS regional electricity prices should be revised to incorporate more realistic assumptions about "wheeling," that is to say, exchange by power by interregional power pools. DOE recognized this problem and the MEFS methodology has been revised to include wheeling of electricity. Factors representing the historical patterns, directions, and proportions of wheeled powers have been incorporated. These changes, are described in the 1980 EIA *Annual Report to Congress,* Volume 3: Forecasts.

*6. Capital Expansion Programs.* Several comments were received that related to the effect capital expansion programs will have on electricity prices.

One noted that since regional forecasts do not represent actual costs and benefits of utility capital expansions programs, individual utility prices forecasts may differ considerably from average price forecasts. This comment is correct. MEFS regional forecasts do not represent specific or actual individual utility plans and programs, and some individual utility price forecasts will differ considerably from the regional forecasted prices. MEFS forecasts are necessarily based on aggregated regional data, reflecting the practical considerations inherent in nationwide data collection and forecasting. There are too many utility service areas to permit collection of data and development of price projections on a utility-specific basis. Accordingly, the use of regional data must be retained.

Other comments stated that the MEFS model does not consider past construction decisions or the impact of abandoning capacity. This is not the case. MEFS explicitly includes both existing utility facilities and announced plans and estimates for construction through 1985 and through 1990. Utility construction decisions in 1995 are modeled on the basis of life cycle cost analyses of alternative utility options projected to be available during that time period. The estimates are, however, aggregated to the DOE regional level. As for abandoned capacity, although it was not explicitly described in the MEFS documentation, savings resulting from closing down existing powerplant facilities are specifically included in MEFS equilibrium solutions. Closed installations are placed in the reserve category and no additional fuel charges are incurred. However, remaining capital costs, if any, continue to be included in the rate base.

*7. Incremental Dispatch of Capacity.* One comment pointed out that the electricity production submodel of MEFS assumes that utilities will dispatch generating units based on their marginal costs, regardless of whether the plant has actually been built. Thus, the comment continued, if levelized costs of a new plant are less than operation, maintenance, and fuel costs of existing capacity, the model will assume that a new plant, or more accurately, an infinitesimal fraction thereof, will be brought into service.

The comment is correct in the sense that the linear programming methods used in MEFS assume that small increments of capacity can be added (and withdrawn) without explicitly ensuring that complete facilities are brought on-line as single units. However, aggregation to the regional level of detail and interregional transfers of electricity generally provide a broad enough capacity base to prevent significant distortion due to this approximation. In addition, new construction is assumed to be equal to or less than the limits shown in utility plans for the time period. Consequently,

the analytical approach of the MEFS model will be retained.

8. *Impact of Conservation and Alternative Technologies.* Three closely related comments were received claiming that the model fails to account for reduced conventional fuel requirements resulting from conservation and the implementation of alternative energy technologies.

These comments are not correct. Estimates of the impact of solar, geothermal, conservation, and other alternative technologies are explicitly included in MEFS. The actual values for the projections presented in the NOPR are given in Chapter 4 and Appendix B.2 of the EIA *Annual Report to Congress,* 1979, Volume Three: Projections. A comparable discussion is found in Chapter 3 and Appendix B.2 of the EIA *Annual Report to Congress,* 1980, Volume Three: Forecasts.

One of the comments pointed out that, based on the EIA 1979 Annual Report to Congress, the MEFS demand model assumes a 3.2-percent growth rate in sales of electricity during the forecast period, identical to the growth rate during the years 1973 to 1978. The comment argued that the 3.2-percent growth rate implies that all government conservation programs, which will have become effective in the early 1980's, are having or will have little or no impact on electricity consumption.

Although this comment correctly identifies the growth rates, the implications drawn from it are incorrect. The growth rates for electricity forecasted for the High Oil Price scenario in the EIA *Annual Report to Congress,* 1979, Volume 3: Projections, and presented in the proposed rule are 2.9 percent from 1978 to 1985, 3.8 percent from 1985 to 1990, and 3.2 percent from 1990 to 1995. Although this does result in a 3.2-percent growth rate from 1978 to 1995, it is neither a straight-line 3.2-percent annual increase nor an assumed rate of increase. MEFS electricity growth rates are forecast (not assumed) based upon outputs from the MEFS Demand Analysis System. The impacts of conservation programs, renewable energy resources, and government initiatives are specifically included in these outputs.

9. *Short Term Energy Forecasts.* Another comment stated that the 1979 forecast for residential electricity prices was grossly overstated. The comment argued that if the price is so inaccurate for the base year, the out-year projections are equally suspect.

This argument is mistaken. The base year forecasts which included the prices to which the comment refers, were developed using the Short-Term Integrated Forecasting System (STIFS). In fact, STIFS is unrelated to MEFS which is used to develop the 1985, 1990 and 1995 forecasts.

## III. Changes Based on Interagency Consultation

### *A. Life Cycle Cost Analysis Starting Point*

A number of comments have been received from Federal agencies, since the publication of the existing rule, requesting clarification of the point in the base year at which operating cash flows are assumed to start. To provide this clarification, DOE is modifying § 436.14(g) to state that energy costs and non-fuel operations and maintenance costs begin to accrue at the beginning of the base year.

### *B. Energy Price Tables*

In response to a number of comments received from Federal agencies since the publication of the January 23, 1980 rule, the types of fuels have been expanded to include *gasoline, liquid petroleum gas* (LPG), *steam coal,* and *natural gas* for major fuel burning installations (MFBI), and the format has been changed to consolidate data by regions.

### *C. Escalation Rates for Federal Buildings in Foreign Countries*

One Federal agency noted that the NOPR does not provide escalation rates for life cycle cost analyses of Federal buildings in foreign countries. There are many difficulties inherent in estimating escalation rates of fuels overseas. Chief among them is that an agency may purchase fuel from both foreign and U.S. sources. Because of these and other variables DOE has been unable to devise specific escalation rates for buildings in foreign countries.

DOE recognizes that agencies such as the Department of Defense have to compare life cycle costs of projects in the United States and overseas. Section 436.14(b)(2) has been added to the rule to require a Federal agency conducting a life cycle cost analysis of a foreign Federal building to use an escalation rate which is reasonable under the circumstances. It would be reasonable for agencies to refer to the U.S. average escalation rates in Table C–11 as a guide.

## IV. Review and Coordination

### *A. NEPA Review*

It has been determined that the promulgation of these amendments to Subpart A of 10 CFR Part 436 does not constitute a major Federal action significantly affecting the quality of the human environment pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, 42 U.S.C. 4321 *et seq.* A similar determination was made with respect to the life cycle costing rule published in January 1980.

### *B. EPA Review*

DOE provided a draft of today's amendments to the Administrator of the Environmental Protection Agency (EPA) for written comments concerning impacts on the quality of the environment, pursuant to section 7(a) of the Federal Energy Administration Act, as amended, 15 U.S.C. 766(a). The Administrator had no comments.

### *C. Other Review*

Executive Order 11912, as amended by Executive Order 12003, requires the Secretary of DOE to obtain the concurrence of the Director of the Office of Management and Budget (OMB). Section 545 of the NECPA or the Executive Order requires the Secretary to consult with the Director of the National Bureau of Standards, the Secretary of Defense, the Secretary of Housing and Urban Development, the Administrator of the Veterans Administration, and the Administrator of the General Services Administration in the establishment of a life-cycle cost methodology. Accordingly, DOE has obtained the concurrence of OMB and has consulted with the listed agencies in the development of this rule.

### *D. Determinations Under Executive Order 12291*

Today's amendments have been reviewed under Executive Order 12291 (46 FR 13193), and it has been determined that the amendments do not constitute a "major" rule, because they are not expected to have an annual effect on the economy of $100 million or more, to result in a major increase in costs or prices for consumers, individual industries, Federal, State or local Government agencies, or geographic regions, or to have significant adverse effects on competition, employment, investment, productivity, innovation or on the ability to compete with foreign-based enterprises in domestic or export markets.

## V. Related Publications

Substantial technical assistance was provided by experts at NBS who are conversant with the technical aspects of life cycle cost analysis and are established consultants in the field. NBS was instrumental in the development of a manual for Federal agencies to use in applying the rule. The manual, entitled "Life Cycle Costing Manual for the

Federal Energy Management Program," was provided to Federal agencies and is available from the Department of Energy, 1000 Independence Avenue, SW., Room 1H–066, Washington, D.C. 20585.

In consideration of the foregoing, DOE hereby amends Chapter II of Title 10, Code of Federal Regulations, by amending Subpart A to Part 436 as set forth below.

(Energy Policy and Conservation Act, as amended (42 U.S.C. 6361); Executive Order 11912, as amended by Executive Order 12003, 42 FR 37523 (July 20, 1977); National Energy Conservation Policy Act, Title V, Part 3, (42 U.S.C. 8255); Department of Energy Organization Act, (42 U.S.C. 7254)).

Issued in Washington, D.C., November 4, 1981.

**Joseph J. Tribble,**

*Assistant Secretary, Conservation and Renewable Energy.*

## PART 436—FEDERAL ENERGY MANAGEMENT AND PLANNING PROGRAMS

For the reasons set forth in the preamble, Subpart A of Part 436 of Title 10 of the Code of Federal Regulations is amended as set forth below.

**Appendix A [Amended]**

1. In the table of contents, under Appendix A, remove the number "10" and insert the number "7."

**Appendix C [Amended]**

2. In the table of contents, under Appendix C, remove all that follows "Part 436—" and insert the following:

Tables C–1 through C–11. Energy Prices and Escalation Rates for DOE Regions I–X and the United States.

**§ 436.11 [Amended]**

3. In § 436.11 insert the following definition between the definitions for "Building system" and "Demand charge":

* * * * *

"Component price" means any variable sub-element of the total charge for a fuel or energy, including but not limited to such charges as "demand charges," "peak charges," "off-peak charges" and "seasonal charges."

* * * * *

4. In § 436.14 (a), remove the number "10" and insert the number "7."

5. In § 436.14, paragraph (b), (c), (d) and (e) are revised to read as follows:

**§ 436.14 Methodological assumptions.**

* * * * *

(b) That energy prices will rise at rates different from the rate of increase in the general price level, and shall adjust base year energy costs by applying the appropriate modified present worth factors of Appendix B, or by applying the annual compound price growth factors of Appendix C together with the appropriate present worth factors in Appendix A, except that—

(1) If the Federal agency is using component prices under § 436.14(c)(2), that agency may use corresponding component real escalation rates provided by the energy supplier.

(2) For Federal buildings in foreign countries, the Federal agency may use a reasonable real escalation rate.

(c) That the price of energy in the base year is the actual price charged for energy delivered to the Federal building except that—

(1) If the actual price is not readily available, the price of energy in the base year shall be the price for the appropriate region, sector and fuel type in Appendix C.

(2) A Federal agency may use actual component prices as provided by the energy supplier.

(d) That the appropriate study period is as follows:

(1) For evaluating and ranking alternative retrofits for an existing Federal building, the study period is the expected life of the retrofit, or 25 years, whichever is shorter.

(2) For determining the total life cycle costs or net savings of mutually exclusive alternatives for a given building system (e.g., alternative designs for a particular system or size of a new or retrofit building system), a uniform study period for all alternatives shall be issued which is equal to—

(i) The estimated life of the mutually exclusive alternative having the longest life, not to exceed 25 years, with appropriate replacement and salvage values for each of the other alternatives; or

(ii) The lowest common multiple of the expected lives of the alternatives, not to exceed 25 years, with appropriate replacement and salvage values for each alternative.

(3) For evaluating alternative designs for a new Federal building, the study period is the expected life of the building or 25 years, whichever is shorter.

(e) That the expected life of any building system is the period of service without major renewal or overhaul, as estimated by a qualified engineer or architect, as appropriate, or any other reliable source. The period of service of a building system shall not be deemed to exceed the expected life of an owned building, or the effective remaining term of a leased building (taking into account renewal options likely to be exercised).

6. In § 436.14, paragraph (g) is revised to read as follows:

* * * * *

(g) That energy costs and non-fuel operation and maintenance costs begin to accrue at the beginning of the base year.

7. Remove Appendices A, B, and C and insert the following:

**Appendix A to Subpart A of Part 436**

TABLE A–1.—SPW FACTORS BASED ON A 7-PERCENT DISCOUNT RATE, FOR FUNDING THE PRESENT VALUE OF FUTURE NON-FUEL, NON-RECURRING COSTS

| | Factor |
|---|---|
| Study period: | |
| 1 | 0.93 |
| 2 | 0.87 |
| 3 | 0.82 |
| 4 | 0.76 |
| 5 | 0.71 |
| 6 | 0.67 |
| 7 | 0.62 |
| 8 | 0.58 |
| 9 | 0.54 |
| 10 | 0.51 |
| 11 | 0.48 |
| 12 | 0.44 |
| 13 | 0.41 |
| 14 | 0.39 |
| 15 | 0.36 |
| 16 | 0.34 |
| 17 | 0.32 |
| 18 | 0.30 |
| 19 | 0.28 |
| 20 | 0.26 |
| 21 | 0.24 |
| 22 | 0.23 |
| 23 | 0.21 |
| 24 | 0.20 |
| 25 | 0.18 |

The formula for finding the present value (P) of a future amount (F) is the following:

$$P = \frac{F}{(1+d)^n}$$

where d = the discount rate, and n = the year in which F occurs.

TABLE A–2.—UPW FACTORS BASED ON A 7-PERCENT DISCOUNT RATE, FOR FUNDING THE PRESENT VALUE OF FUTURE NON-FUEL, RECURRING COSTS

| | Factor |
|---|---|
| Study period: | |
| 1 | 0.93 |
| 2 | 1.81 |
| 3 | 2.62 |
| 4 | 3.39 |
| 5 | 4.10 |
| 6 | 4.77 |
| 7 | 5.39 |
| 8 | 5.97 |
| 9 | 6.52 |
| 10 | 7.02 |
| 11 | 7.50 |
| 12 | 7.94 |
| 13 | 8.36 |
| 14 | 8.75 |
| 15 | 9.11 |
| 16 | 9.45 |
| 17 | 9.76 |
| 18 | 10.06 |
| 19 | 10.34 |
| 20 | 10.59 |

TABLE A-2.—UPW FACTORS BASED ON A 7-PERCENT DISCOUNT RATE, FOR FUNDING THE PRESENT VALUE OF FUTURE NON-FUEL, RECURRING COSTS—Continued

| | Factor |
|---|---|
| 21 | 10.84 |
| 22 | 11.06 |
| 23 | 11.27 |
| 24 | 11.47 |
| 25 | 11.65 |

TABLE A-2.—UPW FACTORS BASED ON A 7-PERCENT DISCOUNT RATE, FOR FUNDING THE PRESENT VALUE OF FUTURE NON-FUEL, RECURRING COSTS—Continued

| | Factor |
|---|---|
| 26 | 11.83 |
| 27 | 11.99 |
| 28 | 12.14 |
| 29 | 12.28 |
| 30 | 12.41 |

The formula for finding the present value (P) of an annually recurring uniform amount (A) is the following:

$$P = A \quad \frac{(1+d)^n - 1}{d\,(1+d)^n}$$

where d = the discount rate, and n = the number of compounding periods over which A occurs.

TABLE B-1.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 1

[Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation— |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | GASLNE |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.98 | 0.96 | 1.02 | 1.02 | 0.99 | 0.98 | 0.96 | 1.02 | 1.02 | 1.03 | 1.06 | 0.98 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.98 | 1.95 | 1.88 | 2.06 | 2.05 | 2.08 | 2.20 | 1.95 |
| 3 | 2.90 | 2.75 | 2.76 | 3.10 | 2.90 | 2.76 | 3.11 | 3.11 | 2.95 | 2.90 | 2.76 | 3.11 | 3.10 | 3.17 | 3.41 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.17 | 3.84 | 3.60 | 4.19 | 4.18 | 3.92 | 3.84 | 3.60 | 4.19 | 4.18 | 4.29 | 4.69 | 3.84 |
| 5 | 4.70 | 4.40 | 4.40 | 5.19 | 4.70 | 4.41 | 5.22 | 5.19 | 4.80 | 4.70 | 4.41 | 5.22 | 5.19 | 5.35 | 5.86 | 4.73 |
| 6 | 5.50 | 5.18 | 5.18 | 6.14 | 5.49 | 5.18 | 6.21 | 6.15 | 5.60 | 5.49 | 5.18 | 6.21 | 6.15 | 6.36 | 6.92 | 5.57 |
| 7 | 6.23 | 5.92 | 5.91 | 7.04 | 6.22 | 5.93 | 7.16 | 7.06 | 6.32 | 6.21 | 5.93 | 7.16 | 7.06 | 7.32 | 7.88 | 6.37 |
| 8 | 6.90 | 6.62 | 6.62 | 7.90 | 6.89 | 6.64 | 8.07 | 7.92 | 6.98 | 6.87 | 6.64 | 8.07 | 7.92 | 8.23 | 8.76 | 7.12 |
| 9 | 7.51 | 7.30 | 7.30 | 8.70 | 7.51 | 7.33 | 8.95 | 8.73 | 7.58 | 7.47 | 7.33 | 8.95 | 8.74 | 9.10 | 9.56 | 7.84 |
| 10 | 8.07 | 7.98 | 7.97 | 9.47 | 8.06 | 8.01 | 9.82 | 9.50 | 8.15 | 8.02 | 8.01 | 9.81 | 9.53 | 9.96 | 10.30 | 8.54 |
| 11 | 8.57 | 8.64 | 8.63 | 10.20 | 8.57 | 8.68 | 10.67 | 10.25 | 8.68 | 8.50 | 8.69 | 10.67 | 10.28 | 10.82 | 11.01 | 9.23 |
| 12 | 9.03 | 9.30 | 9.29 | 10.90 | 9.02 | 9.36 | 11.52 | 10.96 | 9.16 | 8.94 | 9.36 | 11.52 | 11.00 | 11.66 | 11.67 | 9.91 |
| 13 | 9.44 | 9.96 | 9.94 | 11.57 | 9.43 | 10.03 | 12.36 | 11.64 | 9.64 | 9.33 | 10.03 | 12.35 | 11.69 | 12.50 | 12.30 | 10.58 |
| 14 | 9.82 | 10.61 | 10.59 | 12.21 | 9.80 | 10.69 | 13.19 | 12.29 | 10.09 | 9.66 | 10.70 | 13.18 | 12.36 | 13.32 | 12.88 | 11.23 |
| 15 | 10.15 | 11.25 | 11.23 | 12.82 | 10.14 | 11.35 | 14.01 | 12.91 | 10.50 | 10.00 | 11.36 | 14.00 | 13.00 | 14.14 | 13.43 | 11.87 |
| 16 | 10.46 | 11.88 | 11.87 | 13.40 | 10.44 | 12.01 | 14.83 | 13.51 | 10.89 | 10.28 | 12.02 | 14.81 | 13.61 | 14.95 | 13.95 | 12.50 |
| 17 | 10.73 | 12.52 | 12.50 | 13.95 | 10.71 | 12.67 | 15.63 | 14.08 | 11.26 | 10.53 | 12.68 | 15.62 | 14.19 | 15.76 | 14.44 | 13.12 |
| 18 | 10.96 | 13.14 | 13.13 | 14.48 | 10.96 | 13.32 | 16.43 | 14.62 | 11.61 | 10.76 | 13.33 | 16.41 | 14.76 | 16.55 | 14.90 | 13.73 |
| 19 | 11.21 | 13.76 | 13.75 | 14.98 | 11.19 | 13.97 | 17.22 | 15.14 | 11.93 | 10.96 | 13.98 | 17.20 | 15.30 | 17.34 | 15.33 | 14.32 |
| 20 | 11.41 | 14.37 | 14.36 | 15.46 | 11.39 | 14.61 | 18.00 | 15.64 | 12.24 | 11.14 | 14.62 | 17.97 | 15.81 | 18.12 | 15.74 | 14.91 |
| 21 | 11.60 | 14.98 | 14.97 | 15.92 | 11.57 | 15.25 | 18.77 | 16.12 | 12.53 | 11.31 | 15.26 | 18.74 | 16.31 | 18.89 | 16.12 | 15.48 |
| 22 | 11.76 | 15.58 | 15.58 | 16.36 | 11.74 | 15.89 | 19.54 | 16.58 | 12.80 | 11.45 | 15.90 | 19.50 | 16.79 | 19.66 | 16.48 | 16.04 |
| 23 | 11.91 | 16.18 | 16.18 | 16.78 | 11.89 | 16.52 | 20.29 | 17.01 | 13.05 | 11.58 | 16.53 | 20.25 | 17.25 | 20.41 | 16.82 | 16.60 |
| 24 | 12.05 | 16.77 | 16.77 | 17.18 | 12.02 | 17.15 | 21.04 | 17.43 | 13.29 | 11.70 | 17.16 | 21.00 | 17.68 | 21.16 | 17.14 | 17.14 |
| 25 | 12.17 | 17.36 | 17.36 | 17.56 | 12.14 | 17.77 | 21.79 | 17.83 | 13.52 | 11.81 | 17.79 | 21.74 | 18.11 | 21.90 | 17.44 | 17.67 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For l to k escalation periods,

$$UPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^l + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^l + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^l + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\cdots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}}\sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^l,$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n}\left(\frac{1+e}{1+d}\right)^l = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

## TABLE B-2.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 2

[New York, New Jersey, Puerto Rico, Virgin Islands]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation— |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | GASLNE |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.98 | 0.96 | 1.02 | 1.02 | 0.99 | 0.98 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.98 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.97 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |
| 3 | 2.90 | 2.76 | 2.76 | 3.11 | 2.90 | 2.75 | 3.11 | 3.11 | 2.95 | 2.91 | 2.76 | 3.11 | 3.11 | 3.11 | 3.41 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.91 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.69 | 3.84 |
| 5 | 4.70 | 4.41 | 4.40 | 5.19 | 4.70 | 4.40 | 5.22 | 5.19 | 4.83 | 4.70 | 4.41 | 5.22 | 5.19 | 5.21 | 5.91 | 4.73 |
| 6 | 5.50 | 5.18 | 5.18 | 6.15 | 5.49 | 5.18 | 6.21 | 6.15 | 5.71 | 5.48 | 5.18 | 6.21 | 6.16 | 6.19 | 7.08 | 5.57 |
| 7 | 6.22 | 5.92 | 5.91 | 7.05 | 6.22 | 5.92 | 7.16 | 7.06 | 6.54 | 6.19 | 5.93 | 7.16 | 7.07 | 7.14 | 8.19 | 6.36 |
| 8 | 6.89 | 6.63 | 6.62 | 7.91 | 6.89 | 6.64 | 8.07 | 7.92 | 7.34 | 6.84 | 6.64 | 8.07 | 7.94 | 8.04 | 9.25 | 7.12 |
| 9 | 7.51 | 7.32 | 7.29 | 8.72 | 7.50 | 7.32 | 8.95 | 8.74 | 8.10 | 7.43 | 7.33 | 8.95 | 8.77 | 8.91 | 10.26 | 7.83 |
| 10 | 8.09 | 7.99 | 7.96 | 9.49 | 8.08 | 8.00 | 9.81 | 9.52 | 8.81 | 7.98 | 8.01 | 9.81 | 9.56 | 9.77 | 11.21 | 8.54 |
| 11 | 8.62 | 8.66 | 8.63 | 10.23 | 8.61 | 8.68 | 10.66 | 10.26 | 9.48 | 8.50 | 8.68 | 10.66 | 10.32 | 10.61 | 12.10 | 9.22 |
| 12 | 9.12 | 9.32 | 9.26 | 10.94 | 9.11 | 9.35 | 11.50 | 10.98 | 10.11 | 8.98 | 9.36 | 11.50 | 11.05 | 11.45 | 12.95 | 9.90 |
| 13 | 9.59 | 9.98 | 9.93 | 11.61 | 9.58 | 10.02 | 12.34 | 11.66 | 10.71 | 9.42 | 10.03 | 12.33 | 11.75 | 12.28 | 13.74 | 10.58 |
| 14 | 10.03 | 10.63 | 10.58 | 12.25 | 10.01 | 10.68 | 13.16 | 12.31 | 11.27 | 9.84 | 10.69 | 13.15 | 12.42 | 13.10 | 14.49 | 11.21 |
| 15 | 10.44 | 11.28 | 11.22 | 12.86 | 10.42 | 11.34 | 13.97 | 12.93 | 11.80 | 10.23 | 11.35 | 13.97 | 13.06 | 13.91 | 15.19 | 11.85 |
| 16 | 10.82 | 11.92 | 11.85 | 13.44 | 10.80 | 12.00 | 14.78 | 13.53 | 12.30 | 10.59 | 12.01 | 14.77 | 13.68 | 14.70 | 15.85 | 12.47 |
| 17 | 11.17 | 12.55 | 12.48 | 14.00 | 11.15 | 12.65 | 15.57 | 14.10 | 12.77 | 10.93 | 12.66 | 15.56 | 14.27 | 15.49 | 16.48 | 13.09 |
| 18 | 11.51 | 13.18 | 13.10 | 14.53 | 11.48 | 13.30 | 16.36 | 14.65 | 13.21 | 11.25 | 13.31 | 16.34 | 14.84 | 16.27 | 17.07 | 13.69 |
| 19 | 11.81 | 13.81 | 13.71 | 15.04 | 11.79 | 13.94 | 17.14 | 15.17 | 13.62 | 11.55 | 13.96 | 17.11 | 15.39 | 17.05 | 17.62 | 14.28 |
| 20 | 12.10 | 14.43 | 14.32 | 15.53 | 12.08 | 14.58 | 17.91 | 15.67 | 14.02 | 11.82 | 14.60 | 17.87 | 15.91 | 17.81 | 18.14 | 14.86 |
| 21 | 12.37 | 15.04 | 14.93 | 15.99 | 12.35 | 15.22 | 18.68 | 16.15 | 14.39 | 12.08 | 15.24 | 18.62 | 16.41 | 18.56 | 18.63 | 15.43 |
| 22 | 12.63 | 15.65 | 15.52 | 16.43 | 12.60 | 15.85 | 19.42 | 16.61 | 14.73 | 12.32 | 15.87 | 19.37 | 16.90 | 19.31 | 19.10 | 15.98 |
| 23 | 12.86 | 16.25 | 16.12 | 16.85 | 12.84 | 16.48 | 20.16 | 17.05 | 15.06 | 12.54 | 16.50 | 20.10 | 17.36 | 20.04 | 19.53 | 16.53 |
| 24 | 13.08 | 16.85 | 16.71 | 17.25 | 13.05 | 17.11 | 20.89 | 17.46 | 15.37 | 12.75 | 17.13 | 20.83 | 17.80 | 20.77 | 19.94 | 17.07 |
| 25 | 13.29 | 17.44 | 17.29 | 17.64 | 13.26 | 17.73 | 21.61 | 17.86 | 15.66 | 12.94 | 17.76 | 21.55 | 18.23 | 21.49 | 20.33 | 17.59 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$UPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\cdots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_k}\sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t,$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n_k}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^{n_k}\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; Resid—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

## TABLE B-3.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 3

[Pennsylvania, Maryland, West Virginia, Virginia, District of Columbia, Delaware]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation— |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | GASLNE |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.98 | 0.96 | 1.02 | 1.02 | 0.99 | 0.98 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.98 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.97 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |
| 3 | 2.91 | 2.75 | 2.76 | 3.11 | 2.91 | 2.76 | 3.11 | 3.10 | 2.95 | 2.90 | 2.76 | 3.11 | 3.11 | 3.11 | 3.41 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.91 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.69 | 3.84 |
| 5 | 4.72 | 4.40 | 4.40 | 5.20 | 4.72 | 4.41 | 5.22 | 5.20 | 4.83 | 4.73 | 4.41 | 5.22 | 5.22 | 5.20 | 5.92 | 4.73 |
| 6 | 5.55 | 5.18 | 5.17 | 6.19 | 5.55 | 5.18 | 6.21 | 6.19 | 5.72 | 5.56 | 5.18 | 6.21 | 6.21 | 6.19 | 7.10 | 5.57 |
| 7 | 6.34 | 5.92 | 5.91 | 7.13 | 6.34 | 5.93 | 7.16 | 7.15 | 6.56 | 6.34 | 5.92 | 7.16 | 7.18 | 7.13 | 8.23 | 6.36 |
| 8 | 7.07 | 6.63 | 6.61 | 8.04 | 7.07 | 6.64 | 8.07 | 8.06 | 7.37 | 7.08 | 6.64 | 8.07 | 8.10 | 8.04 | 9.30 | 7.12 |
| 9 | 7.76 | 7.31 | 7.28 | 8.91 | 7.76 | 7.33 | 8.93 | 8.94 | 8.14 | 7.78 | 7.32 | 8.94 | 9.00 | 8.90 | 10.33 | 7.84 |
| 10 | 8.41 | 7.98 | 7.95 | 9.74 | 8.41 | 8.01 | 9.79 | 9.78 | 8.87 | 8.44 | 8.00 | 9.80 | 9.86 | 9.76 | 11.30 | 8.54 |
| 11 | 9.01 | 8.65 | 8.61 | 10.53 | 9.01 | 8.68 | 10.64 | 10.60 | 9.56 | 9.05 | 8.67 | 10.64 | 10.69 | 10.60 | 12.22 | 9.23 |
| 12 | 9.58 | 9.32 | 9.26 | 11.30 | 9.58 | 9.36 | 11.47 | 11.37 | 10.20 | 9.62 | 9.34 | 11.48 | 11.49 | 11.43 | 13.08 | 9.91 |
| 13 | 10.11 | 9.97 | 9.90 | 12.03 | 10.11 | 10.02 | 12.30 | 12.12 | 10.82 | 10.16 | 10.01 | 12.31 | 12.26 | 12.25 | 13.90 | 10.57 |
| 14 | 10.60 | 10.63 | 10.54 | 12.73 | 10.60 | 10.69 | 13.11 | 12.84 | 11.39 | 10.66 | 10.67 | 13.12 | 13.00 | 13.06 | 14.67 | 11.22 |
| 15 | 11.07 | 11.27 | 11.17 | 13.40 | 11.07 | 11.35 | 13.91 | 13.53 | 11.93 | 11.13 | 11.32 | 13.92 | 13.71 | 13.86 | 15.39 | 11.87 |
| 16 | 11.50 | 11.91 | 11.79 | 14.04 | 11.50 | 12.00 | 14.70 | 14.19 | 12.45 | 11.57 | 11.98 | 14.72 | 14.40 | 14.65 | 16.07 | 12.49 |
| 17 | 11.91 | 12.55 | 12.40 | 14.66 | 11.91 | 12.66 | 15.48 | 14.83 | 12.93 | 11.98 | 12.62 | 15.50 | 15.08 | 15.43 | 16.72 | 13.11 |
| 18 | 12.29 | 13.18 | 13.01 | 15.25 | 12.29 | 13.30 | 16.25 | 15.44 | 13.39 | 12.37 | 13.27 | 16.28 | 15.70 | 16.19 | 17.33 | 13.72 |
| 19 | 12.64 | 13.81 | 13.62 | 15.82 | 12.65 | 13.95 | 17.01 | 16.03 | 13.82 | 12.73 | 13.90 | 17.04 | 16.31 | 16.95 | 17.90 | 14.32 |
| 20 | 12.97 | 14.43 | 14.21 | 16.36 | 12.98 | 14.59 | 17.76 | 16.59 | 14.22 | 13.07 | 14.54 | 17.79 | 16.91 | 17.70 | 18.44 | 14.90 |
| 21 | 13.28 | 15.04 | 14.80 | 16.89 | 13.29 | 15.22 | 18.50 | 17.13 | 14.60 | 13.38 | 15.17 | 18.54 | 17.47 | 18.44 | 18.95 | 15.47 |
| 22 | 13.58 | 15.65 | 15.38 | 17.38 | 13.58 | 15.85 | 19.23 | 17.65 | 14.96 | 13.68 | 15.79 | 19.27 | 18.02 | 19.16 | 19.43 | 16.04 |
| 23 | 13.85 | 16.26 | 15.96 | 17.86 | 13.86 | 16.48 | 19.95 | 18.15 | 15.30 | 13.96 | 16.41 | 20.00 | 18.55 | 19.88 | 19.86 | 16.59 |
| 24 | 14.10 | 16.86 | 16.53 | 18.32 | 14.11 | 17.10 | 20.66 | 18.63 | 15.62 | 14.22 | 17.03 | 20.71 | 19.06 | 20.59 | 20.31 | 17.13 |
| 25 | 14.34 | 17.45 | 17.09 | 18.76 | 14.35 | 17.72 | 21.36 | 19.09 | 15.93 | 14.46 | 17.64 | 21.42 | 19.55 | 21.29 | 20.71 | 17.67 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$UPW^* = \sum_{l=1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^l + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{l=1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^l + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{l=1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^l + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\ldots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}}\sum_{l=1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^l.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{l=1}^{n_k}\left(\frac{1+e}{1+d}\right)^l = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^{n_k}\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

### TABLE B-4.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 4

[Kentucky, Tennessee, North Carolina, South Carolina, Mississippi, Alabama, Georgia, Florida, Canal Zone]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—Gasline |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.98 | 0.96 | 1.02 | 1.02 | 0.99 | 0.98 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.96 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.97 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |
| 3 | 2.91 | 2.76 | 2.76 | 3.10 | 2.90 | 2.76 | 3.11 | 3.11 | 2.95 | 2.90 | 2.76 | 3.11 | 3.11 | 3.11 | 3.40 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.92 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.68 | 3.84 |
| 5 | 4.73 | 4.41 | 4.40 | 5.21 | 4.73 | 4.41 | 5.22 | 5.22 | 4.85 | 4.73 | 4.41 | 5.22 | 5.23 | 5.21 | 5.91 | 4.73 |
| 6 | 5.58 | 5.18 | 5.17 | 6.21 | 5.57 | 5.18 | 6.21 | 6.23 | 5.74 | 5.58 | 5.18 | 6.21 | 6.25 | 6.19 | 7.10 | 5.57 |
| 7 | 6.37 | 5.92 | 5.91 | 7.16 | 6.37 | 5.93 | 7.16 | 7.21 | 6.60 | 6.39 | 5.92 | 7.16 | 7.24 | 7.14 | 8.24 | 6.37 |
| 8 | 7.13 | 6.64 | 6.61 | 8.11 | 7.12 | 6.64 | 8.05 | 8.16 | 7.43 | 7.16 | 6.64 | 8.07 | 8.21 | 8.05 | 9.34 | 7.12 |
| 9 | 7.85 | 7.32 | 7.28 | 9.02 | 7.84 | 7.32 | 8.95 | 9.09 | 8.23 | 7.89 | 7.32 | 8.95 | 9.16 | 8.92 | 10.39 | 7.84 |
| 10 | 8.53 | 7.99 | 7.95 | 9.89 | 8.52 | 8.00 | 9.82 | 9.99 | 8.97 | 8.58 | 8.00 | 9.82 | 10.08 | 9.79 | 11.38 | 8.54 |
| 11 | 9.16 | 8.57 | 8.51 | 10.73 | 9.15 | 8.58 | 10.68 | 10.86 | 9.67 | 9.23 | 8.57 | 10.68 | 10.98 | 10.65 | 12.31 | 9.23 |
| 12 | 9.76 | 9.33 | 9.26 | 11.54 | 9.74 | 9.35 | 11.54 | 11.70 | 10.32 | 9.85 | 9.34 | 11.54 | 11.86 | 11.52 | 13.17 | 9.91 |
| 13 | 10.32 | 10.00 | 9.90 | 12.33 | 10.31 | 10.02 | 12.39 | 12.51 | 10.93 | 10.42 | 10.01 | 12.39 | 12.69 | 12.37 | 13.98 | 10.58 |
| 14 | 10.85 | 10.66 | 10.54 | 13.08 | 10.83 | 10.69 | 13.23 | 13.30 | 11.50 | 10.97 | 10.67 | 13.24 | 13.52 | 13.23 | 14.73 | 11.23 |
| 15 | 11.35 | 11.31 | 11.17 | 13.81 | 11.33 | 11.35 | 14.07 | 14.07 | 12.04 | 11.48 | 11.33 | 14.08 | 14.32 | 14.08 | 15.44 | 11.88 |
| 16 | 11.82 | 11.96 | 11.79 | 14.52 | 11.79 | 12.00 | 14.90 | 14.81 | 12.54 | 11.96 | 11.98 | 14.91 | 15.10 | 14.93 | 16.10 | 12.51 |
| 17 | 12.26 | 12.60 | 12.40 | 15.20 | 12.23 | 12.65 | 15.73 | 15.53 | 13.00 | 12.42 | 12.63 | 15.74 | 15.85 | 15.78 | 16.72 | 13.13 |
| 18 | 12.67 | 13.24 | 13.01 | 15.86 | 12.65 | 13.30 | 16.55 | 16.22 | 13.44 | 12.84 | 13.28 | 16.57 | 16.59 | 16.62 | 17.30 | 13.74 |
| 19 | 13.06 | 13.87 | 13.62 | 16.49 | 13.03 | 13.95 | 17.37 | 16.90 | 13.85 | 13.25 | 13.92 | 17.39 | 17.30 | 17.46 | 17.84 | 14.34 |
| 20 | 13.43 | 14.50 | 14.21 | 17.10 | 13.40 | 14.59 | 18.18 | 17.55 | 14.23 | 13.63 | 14.56 | 18.20 | 18.00 | 18.30 | 18.34 | 14.92 |
| 21 | 13.77 | 15.13 | 14.80 | 17.69 | 13.74 | 15.22 | 18.98 | 18.18 | 14.58 | 13.99 | 15.19 | 19.01 | 18.67 | 19.13 | 18.81 | 15.50 |
| 22 | 14.10 | 15.75 | 15.38 | 18.26 | 14.08 | 15.86 | 19.78 | 18.79 | 14.92 | 14.32 | 15.82 | 19.81 | 19.33 | 19.96 | 19.28 | 16.07 |
| 23 | 14.40 | 16.36 | 15.96 | 18.82 | 14.37 | 16.49 | 20.58 | 19.38 | 15.23 | 14.64 | 16.44 | 20.61 | 19.97 | 20.79 | 19.67 | 16.63 |
| 24 | 14.69 | 16.98 | 16.53 | 19.35 | 14.65 | 17.11 | 21.37 | 19.96 | 15.52 | 14.94 | 17.07 | 21.40 | 20.59 | 21.61 | 20.06 | 17.17 |
| 25 | 14.96 | 17.58 | 17.09 | 19.86 | 14.92 | 17.73 | 22.15 | 20.51 | 15.79 | 15.23 | 17.68 | 22.19 | 21.20 | 22.43 | 20.42 | 17.71 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to 1995 and beyond. The formula for calculating these UPW* factors is the following: For l to k escalation periods.

$$UPW^* = \sum_{l=1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^l + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{l=1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^l + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{l=1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^l + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\ldots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}}\sum_{l=1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^l.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{l=1}^{n_k}\left(\frac{1+e}{1+d}\right)^l = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^{n_k}\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Nautral Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLINE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

### TABLE B-5—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 5

[Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLINE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.98 | 0.96 | 1.02 | 1.02 | 0.99 | 0.98 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.96 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.98 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |

TABLE B-5—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 5—Continued

[Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLINE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 3 | 2.90 | 2.76 | 2.76 | 3.10 | 2.90 | 2.76 | 3.11 | 3.11 | 2.95 | 2.91 | 2.75 | 3.11 | 3.11 | 3.11 | 3.40 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.92 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.69 | 3.84 |
| 5 | 4.73 | 4.41 | 4.41 | 5.19 | 4.72 | 4.41 | 5.22 | 5.20 | 4.84 | 4.73 | 4.41 | 5.23 | 5.20 | 5.21 | 5.91 | 4.73 |
| 6 | 5.56 | 5.18 | 5.18 | 6.16 | 5.56 | 5.19 | 6.22 | 6.17 | 5.72 | 5.57 | 5.18 | 6.22 | 6.18 | 6.20 | 7.07 | 5.57 |
| 7 | 6.35 | 5.92 | 5.92 | 7.06 | 6.34 | 5.93 | 7.17 | 7.09 | 6.56 | 6.37 | 5.93 | 7.17 | 7.10 | 7.15 | 8.19 | 6.37 |
| 8 | 7.09 | 6.64 | 6.62 | 7.95 | 7.09 | 6.65 | 8.06 | 7.97 | 7.36 | 7.12 | 6.64 | 8.09 | 7.98 | 8.06 | 9.25 | 7.12 |
| 9 | 7.79 | 7.32 | 7.30 | 8.78 | 7.79 | 7.34 | 8.96 | 8.80 | 8.12 | 7.84 | 7.33 | 8.97 | 8.83 | 8.93 | 10.26 | 7.84 |
| 10 | 8.45 | 8.00 | 7.97 | 9.57 | 8.44 | 8.02 | 9.71 | 9.60 | 8.83 | 8.50 | 8.02 | 9.73 | 9.64 | 9.69 | 11.20 | 8.54 |
| 11 | 9.05 | 8.67 | 8.63 | 10.34 | 9.05 | 8.70 | 10.37 | 10.38 | 9.50 | 9.12 | 8.70 | 10.38 | 10.42 | 10.34 | 12.09 | 9.23 |
| 12 | 9.62 | 9.34 | 9.29 | 11.07 | 9.61 | 9.36 | 10.94 | 11.12 | 10.12 | 9.69 | 9.38 | 10.95 | 11.18 | 10.90 | 12.92 | 9.91 |
| 13 | 10.15 | 10.01 | 9.94 | 11.78 | 10.14 | 10.06 | 11.43 | 11.84 | 10.71 | 10.22 | 10.05 | 11.45 | 11.91 | 11.39 | 13.69 | 10.58 |
| 14 | 10.64 | 10.67 | 10.59 | 12.46 | 10.63 | 10.73 | 11.86 | 12.54 | 11.26 | 10.72 | 10.73 | 11.88 | 12.61 | 11.81 | 14.42 | 11.24 |
| 15 | 11.09 | 11.33 | 11.23 | 13.12 | 11.08 | 11.40 | 12.23 | 13.20 | 11.77 | 11.16 | 11.40 | 12.25 | 13.29 | 12.17 | 15.10 | 11.88 |
| 16 | 11.52 | 11.98 | 11.87 | 13.75 | 11.51 | 12.07 | 12.55 | 13.85 | 12.25 | 11.61 | 12.06 | 12.57 | 13.95 | 12.49 | 15.74 | 12.51 |
| 17 | 11.92 | 12.63 | 12.50 | 14.35 | 11.90 | 12.73 | 12.83 | 14.47 | 12.70 | 12.01 | 12.73 | 12.84 | 14.58 | 12.76 | 16.33 | 13.14 |
| 18 | 12.28 | 13.28 | 13.12 | 14.93 | 12.27 | 13.39 | 13.07 | 15.06 | 13.12 | 12.38 | 13.39 | 13.08 | 15.19 | 12.99 | 16.89 | 13.75 |
| 19 | 12.63 | 13.92 | 13.74 | 15.49 | 12.61 | 14.05 | 13.27 | 15.64 | 13.51 | 12.72 | 14.05 | 13.29 | 15.78 | 13.19 | 17.41 | 14.35 |
| 20 | 12.95 | 14.55 | 14.36 | 16.03 | 12.93 | 14.71 | 13.45 | 16.19 | 13.88 | 13.04 | 14.70 | 13.47 | 16.36 | 13.37 | 17.90 | 14.94 |
| 21 | 13.24 | 15.19 | 14.96 | 16.55 | 13.23 | 15.36 | 13.61 | 16.73 | 14.23 | 13.34 | 15.35 | 13.63 | 16.91 | 13.52 | 18.36 | 15.52 |
| 22 | 13.52 | 15.82 | 15.57 | 17.05 | 13.51 | 16.01 | 13.75 | 17.24 | 14.55 | 13.62 | 16.00 | 13.76 | 17.44 | 13.65 | 18.79 | 16.08 |
| 23 | 13.78 | 16.44 | 16.16 | 17.53 | 13.76 | 16.65 | 13.86 | 17.74 | 14.85 | 13.87 | 16.65 | 13.88 | 17.95 | 13.76 | 19.19 | 16.64 |
| 24 | 14.02 | 17.06 | 16.76 | 17.99 | 14.00 | 17.30 | 13.96 | 18.21 | 15.14 | 14.11 | 17.29 | 13.98 | 18.45 | 13.86 | 19.57 | 17.19 |
| 25 | 14.24 | 17.68 | 17.34 | 18.43 | 14.23 | 17.94 | 14.05 | 18.68 | 15.40 | 14.33 | 17.93 | 14.07 | 18.92 | 13.94 | 19.92 | 17.73 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For 1 to k escalation periods,

$$UPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\cdots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}}\sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t,$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Nautral Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLINE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

TABLE B-6.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 6

[Texas, New Mexico, Oklahoma, Arkansas, Louisiana]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLINE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.96 | 0.96 | 0.96 | 1.02 | 0.96 | 0.96 | 1.02 | 1.02 | 0.99 | 0.96 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.96 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.86 | 2.06 | 2.05 | 1.97 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |
| 3 | 2.90 | 2.76 | 2.76 | 3.11 | 2.90 | 2.76 | 3.11 | 3.11 | 2.95 | 2.90 | 2.76 | 3.11 | 3.11 | 3.11 | 3.41 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.92 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.69 | 3.84 |
| 5 | 4.72 | 4.41 | 4.41 | 5.18 | 4.72 | 4.41 | 5.22 | 5.18 | 4.83 | 4.72 | 4.41 | 5.22 | 5.18 | 5.18 | 5.91 | 4.73 |
| 6 | 5.54 | 5.18 | 5.18 | 6.12 | 5.54 | 5.18 | 6.21 | 6.11 | 5.70 | 5.54 | 5.19 | 6.22 | 6.11 | 6.11 | 7.06 | 5.57 |
| 7 | 6.31 | 5.92 | 5.92 | 6.99 | 6.31 | 5.93 | 7.17 | 6.99 | 6.52 | 6.31 | 5.93 | 7.17 | 6.99 | 6.99 | 8.16 | 6.37 |
| 8 | 7.03 | 6.63 | 6.62 | 7.81 | 7.03 | 6.64 | 8.08 | 7.80 | 7.30 | 7.04 | 6.65 | 8.08 | 7.80 | 7.80 | 9.20 | 7.13 |
| 9 | 7.71 | 7.31 | 7.30 | 8.57 | 7.71 | 7.33 | 8.95 | 8.57 | 8.05 | 7.71 | 7.34 | 8.96 | 8.57 | 8.57 | 10.18 | 7.84 |
| 10 | 8.34 | 7.99 | 7.97 | 9.30 | 8.34 | 8.01 | 9.82 | 9.30 | 8.75 | 8.35 | 8.02 | 9.83 | 9.30 | 9.30 | 11.12 | 8.55 |
| 11 | 8.94 | 8.66 | 8.63 | 10.00 | 8.94 | 8.69 | 10.69 | 10.00 | 9.41 | 8.95 | 8.70 | 10.69 | 10.01 | 10.01 | 12.00 | 9.24 |
| 12 | 9.50 | 9.33 | 9.29 | 10.67 | 9.50 | 9.37 | 11.55 | 10.67 | 10.05 | 9.51 | 9.38 | 11.55 | 10.69 | 10.69 | 12.84 | 9.92 |
| 13 | 10.02 | 9.99 | 9.94 | 11.30 | 10.03 | 10.04 | 12.40 | 11.32 | 10.64 | 10.04 | 10.05 | 12.41 | 11.34 | 11.34 | 13.64 | 10.59 |
| 14 | 10.52 | 10.64 | 10.59 | 11.91 | 10.52 | 10.71 | 13.25 | 11.94 | 11.21 | 10.54 | 10.72 | 13.26 | 11.97 | 11.97 | 14.40 | 11.25 |
| 15 | 10.98 | 11.29 | 11.23 | 12.50 | 10.98 | 11.37 | 14.10 | 12.54 | 11.75 | 11.01 | 11.39 | 14.10 | 12.57 | 12.57 | 15.11 | 11.90 |
| 16 | 11.42 | 11.94 | 11.87 | 13.06 | 11.42 | 12.04 | 14.93 | 13.11 | 12.26 | 11.45 | 12.05 | 14.94 | 13.15 | 13.15 | 15.79 | 12.54 |
| 17 | 11.83 | 12.58 | 12.50 | 13.59 | 11.83 | 12.70 | 15.77 | 13.66 | 12.75 | 11.86 | 12.71 | 15.78 | 13.70 | 13.70 | 16.44 | 13.16 |
| 18 | 12.21 | 13.21 | 13.12 | 14.10 | 12.21 | 13.35 | 16.60 | 14.19 | 13.21 | 12.25 | 13.37 | 16.60 | 14.24 | 14.24 | 17.05 | 13.78 |
| 19 | 12.57 | 13.84 | 13.74 | 14.58 | 12.58 | 14.00 | 17.42 | 14.69 | 13.64 | 12.62 | 14.02 | 17.43 | 14.75 | 14.75 | 17.63 | 14.38 |
| 20 | 12.91 | 14.47 | 14.36 | 15.06 | 12.92 | 14.65 | 18.24 | 15.18 | 14.06 | 12.96 | 14.67 | 18.25 | 15.25 | 15.25 | 18.18 | 14.96 |
| 21 | 13.23 | 15.09 | 14.97 | 15.51 | 13.24 | 15.30 | 19.05 | 15.64 | 14.45 | 13.28 | 15.32 | 19.06 | 15.72 | 15.72 | 18.70 | 15.56 |
| 22 | 13.52 | 15.71 | 15.57 | 15.93 | 13.53 | 15.94 | 19.86 | 16.09 | 14.82 | 13.59 | 15.96 | 19.87 | 16.18 | 16.18 | 19.19 | 16.14 |
| 23 | 13.80 | 16.32 | 16.17 | 16.34 | 13.82 | 16.58 | 20.66 | 16.52 | 15.17 | 13.87 | 16.60 | 20.68 | 16.62 | 16.62 | 19.66 | 16.70 |
| 24 | 14.07 | 16.92 | 16.76 | 16.74 | 14.08 | 17.21 | 21.46 | 16.93 | 15.51 | 14.14 | 17.24 | 21.48 | 17.04 | 17.04 | 20.11 | 17.26 |
| 25 | 14.31 | 17.52 | 17.35 | 17.11 | 14.33 | 17.84 | 22.26 | 17.32 | 15.82 | 14.40 | 17.87 | 22.27 | 17.45 | 17.45 | 20.53 | 17.80 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For 1 to k escalation periods,

$$UPW^* = \sum_{t=1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{t=1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{t=1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\ldots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_k}\cdot\sum_{t=1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{t=1}^{n}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period I is Mid-1981 to Mid-1982.

TABLE B–7.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION, 7

[Kansas, Missouri, Iowa, Nebraska]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLNE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.96 | 0.96 | 1.02 | 1.02 | 0.99 | 0.96 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.96 |
| 2 | 1.95 | 1.86 | 1.86 | 2.05 | 1.95 | 1.86 | 2.06 | 2.05 | 1.97 | 1.95 | 1.86 | 2.06 | 2.05 | 2.05 | 2.19 | 1.95 |
| 3 | 2.91 | 2.76 | 2.76 | 3.11 | 2.90 | 2.76 | 3.11 | 3.10 | 2.95 | 2.90 | 2.76 | 3.12 | 3.11 | 3.11 | 3.40 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.17 | 3.91 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.66 | 3.84 |
| 5 | 4.78 | 4.41 | 4.40 | 5.21 | 4.70 | 4.41 | 5.22 | 5.20 | 4.83 | 4.70 | 4.41 | 5.23 | 5.21 | 5.20 | 5.98 | 4.73 |
| 6 | 5.50 | 5.19 | 5.18 | 6.20 | 5.50 | 5.19 | 6.21 | 6.19 | 5.71 | 5.49 | 5.18 | 6.22 | 6.21 | 6.19 | 7.09 | 5.57 |
| 7 | 6.23 | 5.93 | 5.91 | 7.14 | 6.23 | 5.93 | 7.16 | 7.14 | 6.55 | 6.21 | 5.93 | 7.18 | 7.17 | 7.14 | 8.17 | 6.37 |
| 8 | 6.91 | 6.64 | 6.62 | 8.05 | 6.90 | 6.65 | 8.07 | 8.05 | 7.34 | 6.87 | 6.65 | 8.09 | 8.10 | 8.05 | 9.22 | 7.13 |
| 9 | 7.53 | 7.33 | 7.30 | 8.92 | 7.51 | 7.34 | 8.95 | 8.93 | 8.10 | 7.47 | 7.34 | 8.97 | 8.99 | 8.93 | 10.23 | 7.85 |
| 10 | 8.11 | 7.91 | 7.87 | 9.75 | 8.10 | 7.92 | 9.71 | 9.78 | 8.82 | 8.04 | 8.02 | 9.73 | 9.85 | 9.67 | 11.18 | 8.55 |
| 11 | 8.68 | 8.46 | 8.43 | 10.55 | 8.66 | 8.71 | 10.37 | 10.58 | 9.49 | 8.59 | 8.71 | 10.39 | 10.66 | 10.32 | 12.07 | 9.25 |
| 12 | 9.19 | 8.96 | 8.29 | 11.32 | 9.17 | 9.30 | 10.94 | 11.28 | 10.13 | 9.10 | 9.39 | 10.96 | 11.46 | 10.87 | 12.91 | 9.88 |
| 13 | 9.64 | 10.05 | 9.94 | 12.05 | 9.60 | 10.07 | 11.44 | 12.13 | 10.72 | 9.53 | 10.07 | 11.46 | 12.26 | 11.34 | 13.70 | 10.60 |
| 14 | 10.15 | 10.70 | 10.59 | 12.76 | 10.13 | 10.74 | 11.87 | 12.88 | 11.29 | 10.06 | 10.74 | 11.89 | 13.00 | 11.75 | 14.45 | 11.25 |
| 15 | 10.59 | 11.36 | 11.23 | 13.44 | 10.57 | 11.41 | 12.24 | 13.55 | 11.82 | 10.50 | 11.41 | 12.27 | 13.72 | 12.10 | 15.15 | 11.83 |
| 16 | 11.01 | 12.02 | 11.87 | 14.09 | 10.99 | 12.06 | 12.57 | 14.23 | 12.31 | 10.92 | 12.06 | 12.59 | 14.41 | 12.40 | 15.81 | 12.34 |
| 17 | 11.40 | 12.67 | 12.50 | 14.71 | 11.38 | 12.75 | 12.85 | 14.86 | 12.78 | 11.31 | 12.75 | 12.87 | 15.09 | 12.66 | 16.43 | 13.16 |
| 18 | 11.77 | 13.32 | 13.13 | 15.31 | 11.75 | 13.42 | 13.09 | 15.46 | 13.22 | 11.66 | 13.42 | 13.12 | 15.72 | 12.88 | 17.02 | 13.78 |
| 19 | 12.12 | 13.97 | 13.76 | 15.88 | 12.10 | 14.08 | 13.30 | 16.07 | 13.64 | 12.04 | 14.08 | 13.33 | 16.34 | 13.07 | 17.57 | 14.38 |
| 20 | 12.45 | 14.62 | 14.37 | 16.43 | 12.44 | 14.74 | 13.49 | 16.66 | 14.03 | 12.38 | 14.74 | 13.51 | 16.94 | 13.23 | 18.08 | 14.97 |
| 21 | 12.77 | 15.25 | 14.96 | 16.96 | 12.75 | 15.39 | 13.65 | 17.20 | 14.40 | 12.70 | 15.40 | 13.67 | 17.52 | 13.37 | 18.57 | 15.55 |
| 22 | 13.07 | 15.89 | 15.56 | 17.47 | 13.05 | 16.05 | 13.76 | 17.73 | 14.75 | 13.00 | 16.05 | 13.81 | 18.07 | 13.49 | 19.03 | 16.13 |
| 23 | 13.35 | 16.52 | 16.16 | 17.96 | 13.31 | 16.70 | 13.90 | 18.24 | 15.07 | 13.28 | 16.70 | 13.93 | 18.61 | 13.58 | 19.46 | 16.69 |
| 24 | 13.61 | 17.15 | 16.75 | 18.42 | 13.60 | 17.35 | 14.01 | 18.73 | 15.38 | 13.57 | 17.35 | 14.05 | 19.13 | 13.68 | 19.87 | 17.24 |
| 25 | 13.86 | 17.78 | 17.37 | 19.07 | 13.85 | 17.99 | 14.10 | 19.20 | 15.67 | 13.82 | 18.00 | 14.12 | 19.62 | 13.76 | 20.25 | 17.79 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$UPW^* = \sum_{t=1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{t=1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{t=1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\ldots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_k}\cdot\sum_{t=1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{t=1}^{n}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

TABLE B–8.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 8

[Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLNE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.96 | 0.96 | 1.02 | 1.02 | 0.99 | 0.96 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.96 |
| 2 | 1.95 | 1.86 | 1.86 | 2.05 | 1.95 | 1.86 | 2.06 | 2.05 | 1.97 | 1.95 | 1.86 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |
| 3 | 2.91 | 2.76 | 2.76 | 3.11 | 2.90 | 2.76 | 3.11 | 3.11 | 2.95 | 2.91 | 2.76 | 3.11 | 3.11 | 3.11 | 3.40 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.91 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.66 | 3.84 |
| 5 | 4.69 | 4.41 | 4.41 | 5.18 | 4.68 | 4.41 | 5.23 | 5.18 | 4.81 | 4.67 | 4.41 | 5.24 | 5.21 | 5.18 | 5.98 | 4.73 |
| 6 | 5.44 | 5.18 | 5.18 | 6.12 | 5.49 | 5.19 | 6.22 | 6.12 | 5.65 | 5.39 | 5.18 | 6.22 | 6.12 | 6.12 | 7.08 | 5.57 |
| 7 | 6.12 | 5.92 | 5.91 | 6.99 | 6.10 | 5.95 | 7.17 | 6.99 | 6.44 | 6.09 | 5.98 | 7.17 | 6.99 | 7.00 | 8.05 | 6.37 |
| 8 | 6.73 | 6.64 | 6.62 | 7.81 | 6.71 | 6.65 | 8.08 | 7.81 | 7.18 | 6.66 | 6.64 | 8.06 | 7.81 | 7.82 | 9.03 | 7.12 |
| 9 | 7.28 | 7.32 | 7.30 | 8.58 | 7.24 | 7.39 | 8.96 | 8.58 | 7.86 | 7.06 | 7.38 | 8.96 | 8.58 | 8.58 | 9.84 | 7.84 |
| 10 | 7.78 | 8.00 | 7.96 | 9.30 | 7.73 | 8.02 | 9.83 | 9.31 | 8.51 | 7.52 | 8.01 | 9.89 | 9.31 | 9.32 | 10.60 | 8.54 |

TABLE B-8.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 8—Continued

[Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLINE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 11 | 9.23 | 8.87 | 8.63 | 9.99 | 9.17 | 8.70 | 10.70 | 10.00 | 9.13 | 7.91 | 8.09 | 10.70 | 10.00 | 10.02 | 11.81 | 9.23 |
| 12 | 9.84 | 9.34 | 9.28 | 10.65 | 9.57 | 9.38 | 11.06 | 10.66 | 9.69 | 8.25 | 8.37 | 11.57 | 10.66 | 10.68 | 12.37 | 9.91 |
| 13 | 9.01 | 10.00 | 9.93 | 11.27 | 8.92 | 10.05 | 12.42 | 11.26 | 10.23 | 8.56 | 10.04 | 12.43 | 11.29 | 11.31 | 13.06 | 10.56 |
| 14 | 9.34 | 10.66 | 10.58 | 11.86 | 9.25 | 10.79 | 13.28 | 11.86 | 10.73 | 8.83 | 10.71 | 13.29 | 11.89 | 11.91 | 13.75 | 11.24 |
| 15 | 9.65 | 11.32 | 11.21 | 12.42 | 9.54 | 11.40 | 14.13 | 12.44 | 11.21 | 9.07 | 11.38 | 14.14 | 12.46 | 12.48 | 14.38 | 11.88 |
| 16 | 9.92 | 11.97 | 11.85 | 12.95 | 9.80 | 12.07 | 14.98 | 12.96 | 11.65 | 9.26 | 12.05 | 15.00 | 13.01 | 13.03 | 14.98 | 12.52 |
| 17 | 10.17 | 12.62 | 12.47 | 13.46 | 10.04 | 12.73 | 15.82 | 13.49 | 12.07 | 9.47 | 12.72 | 15.84 | 13.53 | 13.54 | 15.54 | 13.15 |
| 18 | 10.40 | 13.26 | 13.08 | 13.94 | 10.26 | 13.40 | 16.67 | 13.97 | 12.46 | 9.64 | 13.36 | 16.69 | 14.02 | 14.04 | 16.08 | 13.76 |
| 19 | 10.60 | 13.88 | 13.71 | 14.40 | 10.45 | 14.06 | 17.50 | 14.43 | 12.83 | 9.79 | 14.04 | 17.53 | 14.49 | 14.51 | 16.55 | 14.37 |
| 20 | 10.79 | 14.54 | 14.31 | 14.83 | 10.63 | 14.72 | 18.34 | 14.87 | 13.18 | 9.92 | 14.69 | 18.37 | 14.94 | 14.95 | 17.02 | 14.98 |
| 21 | 10.95 | 15.17 | 14.92 | 15.24 | 10.79 | 15.36 | 19.17 | 15.29 | 13.51 | 10.03 | 15.35 | 19.20 | 15.37 | 15.38 | 17.48 | 15.54 |
| 22 | 11.11 | 15.79 | 15.51 | 15.63 | 10.93 | 16.00 | 19.99 | 15.69 | 13.82 | 10.14 | 16.00 | 20.01 | 15.78 | 15.78 | 17.88 | 16.12 |
| 23 | 11.24 | 16.41 | 16.10 | 16.00 | 11.06 | 16.64 | 20.81 | 16.08 | 14.11 | 10.23 | 16.65 | 20.86 | 16.16 | 16.16 | 18.24 | 16.69 |
| 24 | 11.37 | 17.04 | 16.69 | 16.35 | 11.17 | 17.25 | 21.63 | 16.43 | 14.38 | 10.31 | 17.30 | 21.68 | 16.53 | 16.53 | 18.61 | 17.24 |
| 25 | 11.48 | 17.65 | 17.27 | 16.70 | 11.28 | 17.86 | 22.45 | 16.76 | 14.63 | 10.38 | 17.94 | 22.50 | 16.88 | 16.86 | 18.95 | 17.79 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7-percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$UPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^1 + \left(\frac{1+e_1}{1+d}\right)^{n_1} \sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^1 + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2} \sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^1 + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2} \ldots \left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}} \sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^1.$$

where $n_k$=the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n}\left(\frac{1+e}{1+d}\right)^1 = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLINE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

TABLE B-9—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION [1]

[California, Nevada, Arizona, Hawaii, Trust Territory of the Pacific Islands, American Samoa, Guam]

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLINE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.96 | 0.96 | 0.96 | 1.02 | 0.96 | 0.96 | 1.00 | 1.02 | 0.99 | 0.96 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.96 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.05 | 2.05 | 1.98 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.20 | 1.95 |
| 3 | 2.90 | 2.76 | 2.76 | 3.11 | 2.90 | 2.76 | 3.11 | 3.11 | 2.95 | 2.90 | 2.76 | 3.11 | 3.11 | 3.11 | 3.41 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.16 | 3.84 | 3.60 | 4.19 | 4.18 | 3.92 | 3.84 | 3.60 | 4.18 | 4.16 | 4.16 | 4.66 | 3.84 |
| 5 | 4.71 | 4.41 | 4.41 | 5.17 | 4.71 | 4.41 | 5.22 | 5.17 | 4.83 | 4.71 | 4.41 | 5.23 | 5.17 | 5.21 | 5.91 | 4.73 |
| 6 | 5.52 | 5.18 | 5.18 | 6.10 | 5.53 | 5.19 | 6.23 | 6.09 | 5.70 | 5.52 | 5.19 | 6.23 | 6.09 | 6.20 | 7.06 | 5.57 |
| 7 | 6.28 | 5.93 | 5.92 | 6.96 | 6.26 | 5.94 | 7.17 | 6.95 | 6.52 | 6.25 | 5.94 | 7.17 | 6.95 | 7.15 | 8.15 | 6.37 |
| 8 | 6.99 | 6.64 | 6.62 | 7.75 | 6.98 | 6.65 | 8.06 | 7.74 | 7.30 | 6.96 | 6.65 | 8.06 | 7.74 | 8.00 | 9.18 | 7.12 |
| 9 | 7.63 | 7.32 | 7.30 | 8.50 | 7.64 | 7.36 | 8.97 | 8.48 | 8.04 | 7.60 | 7.36 | 8.97 | 8.48 | 8.84 | 10.16 | 7.84 |
| 10 | 8.24 | 8.00 | 7.97 | 9.19 | 8.25 | 8.04 | 9.85 | 9.17 | 8.72 | 8.23 | 8.04 | 9.85 | 9.17 | 9.82 | 11.06 | 8.56 |
| 11 | 8.80 | 8.66 | 8.63 | 9.85 | 8.81 | 8.72 | 10.72 | 9.83 | 9.37 | 8.79 | 8.73 | 10.72 | 9.82 | 10.70 | 11.93 | 9.24 |
| 12 | 9.32 | 9.35 | 9.29 | 10.47 | 9.36 | 9.41 | 11.59 | 10.46 | 9.97 | 9.31 | 9.41 | 11.59 | 10.44 | 11.58 | 12.78 | 9.92 |
| 13 | 9.81 | 10.02 | 9.94 | 11.05 | 9.82 | 10.09 | 12.45 | 11.09 | 10.53 | 9.79 | 10.09 | 12.46 | 11.09 | 12.47 | 13.47 | 10.59 |
| 14 | 10.25 | 10.68 | 10.59 | 11.60 | 10.25 | 10.77 | 13.32 | 11.58 | 11.05 | 10.23 | 10.77 | 13.32 | 11.58 | 13.28 | 14.17 | 11.25 |
| 15 | 10.67 | 11.34 | 11.23 | 12.12 | 10.68 | 11.45 | 14.17 | 12.10 | 11.55 | 10.64 | 11.45 | 14.18 | 12.10 | 14.20 | 14.82 | 11.89 |
| 16 | 11.05 | 12.00 | 11.87 | 12.61 | 11.07 | 12.12 | 15.02 | 12.59 | 12.00 | 11.02 | 12.12 | 15.04 | 12.58 | 15.11 | 15.43 | 12.53 |
| 17 | 11.41 | 12.65 | 12.50 | 13.07 | 11.43 | 12.80 | 15.87 | 13.08 | 12.43 | 11.37 | 12.80 | 15.89 | 13.05 | 16.00 | 16.00 | 13.15 |
| 18 | 11.74 | 13.28 | 13.12 | 13.50 | 11.76 | 13.47 | 16.72 | 13.46 | 12.80 | 11.70 | 13.47 | 16.75 | 13.46 | 16.86 | 16.53 | 13.76 |
| 19 | 12.05 | 13.88 | 13.74 | 13.91 | 12.07 | 14.14 | 17.56 | 13.89 | 13.21 | 12.00 | 14.14 | 17.58 | 13.90 | 17.77 | 17.03 | 14.37 |
| 20 | 12.33 | 14.57 | 14.36 | 14.29 | 12.36 | 14.80 | 18.40 | 14.36 | 13.56 | 12.28 | 14.80 | 18.42 | 14.29 | 18.68 | 17.50 | 14.96 |
| 21 | 12.60 | 15.21 | 14.96 | 14.66 | 12.62 | 15.47 | 19.23 | 14.84 | 13.89 | 12.54 | 15.47 | 19.25 | 14.85 | 19.54 | 17.96 | 15.54 |
| 22 | 12.84 | 15.84 | 15.56 | 15.00 | 12.87 | 16.13 | 20.06 | 14.99 | 14.19 | 12.78 | 16.13 | 20.08 | 15.00 | 20.43 | 18.34 | 16.11 |
| 23 | 13.07 | 16.46 | 16.16 | 15.32 | 13.10 | 16.79 | 20.88 | 15.31 | 14.48 | 13.00 | 16.79 | 20.91 | 15.33 | 21.32 | 18.72 | 16.67 |
| 24 | 13.28 | 17.08 | 16.76 | 15.62 | 13.31 | 17.45 | 21.70 | 15.62 | 14.74 | 13.21 | 17.45 | 21.74 | 15.63 | 22.21 | 19.07 | 17.22 |
| 25 | 13.48 | 17.70 | 17.34 | 15.91 | 13.51 | 18.10 | 22.52 | 15.90 | 14.99 | 13.40 | 18.10 | 22.55 | 15.93 | 23.10 | 19.40 | 17.76 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$UPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \cdots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\cdots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}}\sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1 - \left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

## TABLE B–10.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION,[1] DOE REGION 10

[Washington, Oregon, Idaho, Alaska]

| | [illegible] | | | | Commercial sector | | | | | [illegible] | | | | | | Transportation—GASLNE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | [illegible] | [illegible] | [illegible] | 1.02 | 0.98 | [illegible] | 1.02 | 1.02 | 0.99 | [illegible] | 0.96 | 1.02 | 1.02 | 1.02 | [illegible] | 0.98 |
| 2 | 1.95 | [illegible] | [illegible] | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.97 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.19 | 1.95 |
| 3 | 2.91 | 2.76 | 2.76 | 3.11 | [illegible] | 2.76 | 3.11 | 3.11 | 2.95 | [illegible] | 2.76 | 3.11 | 3.11 | 3.11 | [illegible] | 2.90 |
| 4 | [illegible] | [illegible] | [illegible] | 4.18 | [illegible] | [illegible] | 4.19 | 4.18 | 3.91 | [illegible] | [illegible] | 4.19 | 4.18 | 4.18 | 4.67 | 3.84 |
| 5 | 4.75 | 4.41 | 4.41 | 5.14 | 4.75 | 4.41 | 5.22 | 5.14 | [illegible] | 4.78 | 4.41 | 5.22 | 5.13 | 5.21 | [illegible] | 4.73 |
| 6 | [illegible] | 5.18 | 5.18 | 6.01 | 5.63 | 5.19 | 6.22 | [illegible] | [illegible] | 5.72 | 5.19 | [illegible] | [illegible] | 6.19 | 7.25 | 5.57 |
| 7 | 6.49 | 5.93 | [illegible] | 6.79 | [illegible] | 5.94 | 7.18 | 6.77 | [illegible] | [illegible] | [illegible] | 7.17 | [illegible] | 7.14 | [illegible] | 6.37 |
| 8 | 7.32 | [illegible] | [illegible] | 7.49 | 7.33 | 6.65 | 8.10 | 7.46 | 7.82 | 7.59 | [illegible] | [illegible] | 7.42 | [illegible] | 9.85 | 7.13 |
| 9 | 8.12 | 7.33 | 7.30 | 8.12 | 8.13 | 7.35 | [illegible] | [illegible] | 8.81 | 8.53 | 7.35 | 8.97 | 8.02 | [illegible] | 11.16 | 7.85 |
| 10 | [illegible] | [illegible] | 7.97 | 8.70 | [illegible] | [illegible] | [illegible] | [illegible] | 9.75 | [illegible] | 8.04 | [illegible] | 8.58 | [illegible] | [illegible] | 8.55 |
| 11 | 9.55 | [illegible] | 8.63 | 9.25 | 9.57 | 8.72 | 10.74 | 9.19 | 10.63 | 10.17 | 8.72 | 10.73 | 9.10 | 10.65 | 13.56 | 9.24 |
| 12 | 10.18 | [illegible] | [illegible] | 9.76 | 10.20 | 9.41 | 11.61 | [illegible] | 11.47 | 10.89 | 9.41 | 11.60 | 9.59 | 11.53 | 14.67 | 9.92 |
| 13 | 10.76 | 10.03 | [illegible] | 10.23 | 10.78 | 10.09 | 12.49 | 10.15 | 12.26 | 11.54 | 10.09 | 12.46 | 10.03 | 12.40 | 15.71 | 10.59 |
| 14 | 11.30 | 10.69 | 10.59 | 10.67 | 11.32 | 10.77 | 13.35 | 10.58 | 13.00 | 12.14 | 10.77 | 13.33 | 10.45 | 13.27 | 16.70 | 11.25 |
| 15 | 11.79 | 11.35 | 11.23 | 11.07 | 11.82 | 11.45 | 14.22 | 10.98 | 13.71 | 12.68 | 11.45 | 14.19 | 10.84 | 14.15 | 17.64 | 11.90 |
| 16 | 12.25 | 12.01 | 11.87 | 11.45 | 12.27 | 12.12 | 15.08 | 11.35* | 14.38 | 13.18 | 12.12 | 15.05 | 11.20 | 15.02 | 18.52 | 12.53 |
| 17 | 12.67 | [illegible] | 12.50 | 11.81 | [illegible] | 12.80 | 15.94 | 11.69 | 15.01 | 13.63 | 12.80 | 15.90 | 11.53 | 15.90 | 19.35 | 13.16 |
| 18 | 13.06 | 13.31 | 13.12 | 12.13 | 13.08 | 13.47 | 16.80 | 12.01 | 15.60 | 14.05 | 13.47 | 16.75 | 11.84 | 16.78 | 20.14 | 13.77 |
| 19 | 13.42 | [illegible] | 13.74 | 12.44 | 13.44 | 14.14 | 17.66 | 12.31 | 16.17 | 14.42 | 14.14 | 17.60 | 12.12 | 17.65 | [illegible] | 14.37 |
| 20 | 13.74 | 14.60 | 14.35 | 12.72 | 13.77 | 14.80 | 18.51 | 12.59 | 16.70 | 14.77 | [illegible] | 18.44 | 12.39 | 18.53 | 21.59 | 14.96 |
| 21 | 14.05 | 15.23 | [illegible] | 12.99 | 14.07 | 15.47 | 19.36 | 12.84 | 17.20 | 15.09 | 15.47 | 19.28 | 12.64 | 19.41 | [illegible] | 15.54 |
| 22 | 14.33 | 15.87 | [illegible] | 13.23 | 14.35 | 16.13 | [illegible] | 13.08 | 17.68 | 15.37 | 16.13 | 20.11 | 12.87 | 20.29 | 22.89 | 16.12 |
| 23 | 14.59 | [illegible] | 16.16 | 13.46 | 14.61 | 16.79 | 21.04 | 13.30 | 18.13 | 15.64 | 16.79 | 20.95 | 13.08 | 21.18 | 23.49 | 16.68 |
| 24 | 14.83 | 17.12 | 16.75 | 13.67 | 14.85 | 17.45 | 21.88 | 13.51 | 18.55 | 15.88 | 17.45 | 21.78 | 13.28 | 22.06 | 24.05 | 17.23 |
| 25 | 15.05 | 17.74 | 17.34 | 13.87 | 15.07 | 18.10 | 22.72 | 13.70 | 18.95 | 16.10 | 18.10 | [illegible] | 13.46 | [illegible] | 24.58 | 17.77 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$JPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \cdots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\cdots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_{k-1}}\sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1 - \left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

## TABLE B–11.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION[1] UNITED STATES AVERAGE

| Residential sector | | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation—GASLNE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESID | NAT-GAS | COAL | ELEC | DIST | RESID | NAT-GAS | MFBI | COAL | |
| 1 | 0.98 | 0.96 | 0.96 | 1.02 | 0.98 | 0.96 | 1.02 | 1.02 | 0.99 | 0.98 | 0.96 | 1.02 | 1.02 | 1.02 | 1.06 | 0.98 |
| 2 | 1.95 | 1.88 | 1.88 | 2.05 | 1.95 | 1.88 | 2.06 | 2.05 | 1.97 | 1.95 | 1.88 | 2.06 | 2.05 | 2.05 | 2.19 | 1.95 |
| 3 | 2.90 | 2.76 | 2.76 | 3.11 | 2.90 | 2.76 | 3.11 | 3.10 | 2.95 | 2.90 | 2.76 | 3.11 | 3.10 | 3.11 | 3.40 | 2.90 |
| 4 | 3.84 | 3.60 | 3.60 | 4.18 | 3.84 | 3.60 | 4.19 | 4.18 | 3.92 | 3.84 | 3.60 | 4.19 | 4.18 | 4.18 | 4.68 | 3.84 |
| 5 | 4.72 | 4.41 | 4.40 | 5.19 | 4.72 | 4.41 | 5.22 | 5.19 | 4.84 | 4.72 | 4.41 | 5.22 | 5.18 | 5.14 | 5.90 | 4.73 |
| 6 | 5.54 | 5.18 | 5.18 | 6.15 | 5.54 | 5.18 | 6.21 | 6.15 | 5.71 | 5.55 | 5.18 | 6.21 | 6.13 | 6.00 | 7.08 | 5.57 |
| 7 | 6.31 | 5.92 | 5.91 | 7.06 | 6.31 | 5.93 | 7.16 | 7.07 | 6.54 | 6.33 | 5.93 | 7.16 | 7.02 | 6.76 | 8.20 | 6.37 |
| 8 | 7.03 | 6.63 | 6.62 | 7.92 | 7.02 | 6.64 | 8.07 | 7.93 | 7.34 | 7.06 | 6.64 | 8.07 | 7.86 | 7.45 | 9.28 | 7.12 |
| 9 | 7.71 | 7.31 | 7.29 | 8.74 | 7.69 | 7.33 | 8.95 | 8.75 | 8.09 | 7.75 | 7.33 | 8.94 | 8.66 | 8.06 | 10.31 | 7.84 |
| 10 | 8.34 | 7.99 | 7.96 | 9.52 | 8.32 | 8.01 | 9.80 | 9.54 | 8.80 | 8.39 | 8.01 | 9.76 | 9.42 | 8.65 | 11.29 | 8.54 |
| 11 | 8.93 | 8.66 | 8.63 | 10.26 | 8.90 | 8.69 | 10.62 | 10.30 | 9.46 | 8.99 | 8.68 | 10.54 | 10.15 | 9.22 | 12.21 | 9.23 |
| 12 | 9.48 | 9.32 | 9.28 | 10.98 | 9.45 | 9.36 | 11.42 | 11.02 | 10.09 | 9.55 | 9.36 | 11.29 | 10.85 | 9.76 | 13.07 | 9.91 |

TABLE B–11.—UPW* DISCOUNT FACTORS ADJUSTED FOR ENERGY PRICE ESCALATION[1] UNITED STATES AVERAGE—Continued

| | Residential sector | | | | Commercial sector | | | | | Industrial sector | | | | | | Transportation— |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP | ELEC | DIST | LPG | NAT-GAS | ELEC | DIST | RESD | NAT-GAS | COAL | ELEC | DIST | RESD | NAT-GAS | MFBI | COAL | GASLNE |
| 13 | [illegible] | [illegible] | [illegible] | 11.66 | [illegible] | 10.03 | 12.19 | 11.71 | 10.67 | 10.07 | 10.03 | 11.99 | 11.52 | 10.28 | 13.89 | 10.58 |
| 14 | 10.47 | 10.64 | 10.58 | 12.31 | 10.43 | 10.70 | 12.94 | 12.38 | 11.23 | 10.56 | 10.70 | 12.66 | 12.17 | 10.78 | 14.66 | 11.24 |
| 15 | 10.91 | 11.29 | 11.21 | 12.94 | 10.87 | 11.36 | 13.67 | 13.01 | 11.75 | 11.01 | 11.36 | 13.29 | 12.80 | 11.26 | 15.39 | 11.88 |
| 16 | 11.33 | 11.93 | 11.85 | 13.54 | 11.28 | 12.02 | 14.38 | 13.63 | 12.23 | 11.44 | 12.02 | 13.89 | 13.40 | 11.72 | [illegible] | 12.51 |
| 17 | 11.72 | 12.57 | 12.47 | 14.11 | 11.66 | [illegible] | 15.07 | 14.21 | 12.69 | 11.83 | 12.67 | 14.47 | 13.97 | 12.16 | 16.73 | 13.13 |
| 18 | 12.08 | 13.21 | 13.09 | [illegible] | 12.02 | 13.33 | 15.73 | 14.77 | 13.13 | 12.20 | 13.33 | 15.01 | 14.52 | 12.59 | 17.34 | 13.74 |
| 19 | 12.42 | 13.84 | 13.71 | 15.18 | 12.36 | [illegible] | 16.38 | 15.31 | 13.53 | 12.55 | 13.97 | 15.52 | 15.06 | 12.99 | 17.92 | 14.34 |
| 20 | 12.73 | 14.46 | 14.32 | [illegible] | 12.67 | 14.63 | 17.01 | 15.83 | 13.91 | 12.87 | 14.62 | 16.01 | 15.57 | 13.39 | 18.46 | 14.93 |
| [illegible] | 13.03 | 15.08 | 14.92 | 16.16 | [illegible] | 15.27 | 17.62 | 16.32 | 14.27 | 13.17 | 15.26 | 16.47 | [illegible] | 13.76 | [illegible] | 15.51 |
| 22 | 13.30 | 15.70 | 15.52 | [illegible] | 13.23 | 15.91 | [illegible] | [illegible] | 14.61 | 13.45 | 15.90 | 16.91 | 16.53 | 14.12 | 19.46 | [illegible] |
| 23 | 13.56 | 16.31 | 16.11 | 17.06 | 13.48 | 16.54 | 18.78 | 17.25 | 14.93 | 13.71 | 16.54 | 17.32 | [illegible] | 14.47 | 19.92 | 16.64 |
| 24 | 13.79 | 16.91 | 16.70 | 17.48 | 13.71 | 17.18 | 19.34 | 17.69 | 15.22 | [illegible] | 17.17 | 17.72 | 17.42 | 14.80 | 20.35 | 17.19 |
| 25 | 14.02 | 17.51 | 17.28 | [illegible] | 13.93 | 17.80 | 19.87 | 18.10 | 15.50 | 14.19 | 17.79 | [illegible] | 17.84 | 15.12 | 20.76 | 17.72 |

[1] These "modified" uniform present worth discount (UPW*) factors are based on a 7 percent discount rate and include the EIA projected real escalation rates in energy prices developed from the Mid-Term Energy Forecasting System (MEFS), for the periods mid-1981 to mid-1985, mid-1985 to mid-1990, and mid-1990 to mid-1995 and beyond. The formula for calculating these UPW* factors is the following: For I to k escalation periods,

$$UPW^* = \sum_{1}^{n_1}\left(\frac{1+e_1}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\sum_{1}^{n_2}\left(\frac{1+e_2}{1+d}\right)^t + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\sum_{1}^{n_3}\left(\frac{1+e_3}{1+d}\right)^t + \ldots + \left(\frac{1+e_1}{1+d}\right)^{n_1}\left(\frac{1+e_2}{1+d}\right)^{n_2}\cdots\left(\frac{1+e_{k-1}}{1+d}\right)^{n_k}\sum_{1}^{n_k}\left(\frac{1+e_k}{1+d}\right)^t.$$

where $n_k$ = the length of the period for a given escalation rate in a given period, and the subscript k indicates the escalation period;

d = the discount rate; and $\sum_{1}^{n}\left(\frac{1+e}{1+d}\right)^t = \left(\frac{1+e}{d-e}\right)\left(1-\left(\frac{1+e}{1+d}\right)^n\right)$.

NOTE.—ELEC—Electricity; DIST—Distillate; RESID—Residual; NATGAS—Natural Gas; MFBI—Natural Gas (MFBI); COAL—Steam Coal; GASLNE—Gasoline; SP—Study Period. Study Period 1 is Mid-1981 to Mid-1982.

## TABLE C–1.—Energy Prices and Escalation Rates

[DOE Region 1]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base year | | Mid-1985 | Mid-1990 | Mid-1995 | | | |
| | (Dollars per Sales Unit)[1] | (Dollars $10^6$ Btu) | (Dollars $10^6$ Btu) | (Dollars $10^6$ Btu) | (Dollars $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| RESIDENTIAL SECTOR | | | | | | | | |
| Electricity | .085 (kWh) | [illegible] | [illegible] | [illegible] | 23.86 | 5.28 | −1.59 | −3.25 |
| Distillate | 1.365 (gal) | [illegible] | [illegible] | [illegible] | 16.45 | 2.50 | [illegible] | 6.03 |
| LPG | .884 (gal) | [illegible] | 10.23 | 11.51 | 15.47 | 2.52 | 2.39 | [illegible] |
| Natural Gas | .005 ($ft^3$) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | 2.10 |
| COMMERCIAL SECTOR | | | | | | | | |
| Electricity | .084 (kWh) | 24.53 | 30.12 | [illegible] | [illegible] | 5.27 | −1.62 | −3.29 |
| Distillate | 1.265 (gal) | 9.12 | 10.07 | 11.49 | [illegible] | 2.51 | 2.66 | [illegible] |
| Residual | .942 (gal) | 6.29 | [illegible] | 10.12 | 13.48 | [illegible] | 2.66 | 5.90 |
| Natural Gas | .005 ($ft^3$) | 4.76 | [illegible] | 7.10 | [illegible] | [illegible] | 1 19 | [illegible] |
| Steam Coal | 58.275 (ton) | [illegible] | 3,29 | 2,85 | [illegible] | 6.12 | −2.78 | .66 |
| INDUSTRIAL SECTOR | | | | | | | | |
| Electricity | .070 (kWh) | 20,47 | 25.14 | [illegible] | 18.51 | [illegible] | −1.94 | −4.07 |
| Distillate | 1.263 (gal) | 9.11 | [illegible] | 11,49 | 15,66 | 2,51 | [illegible] | 6.39 |
| Residual | .949 (gal) | [illegible] | [illegible] | 10.19 | 13.55 | [illegible] | [illegible] | [illegible] |
| Natural Gas | .004 ($ft^3$) | 4.22 | 5.92 | 6.34 | 7.23 | 8.84 | 1.38 | 2.65 |
| Nat Gas MFBI | .006 ($ft^3$) | [illegible] | [illegible] | 9.58 | 12.76 | [illegible] | 1.77 | [illegible] |
| Steam Coal | 43.875 (ton) | 1.95 | [illegible] | 2.85 | [illegible] | 13.93 | −2.78 | .66 |
| TRANSPORTATION | | | | | | | | |
| Gasoline | 1.641 | 13.12 | 16.11 | 17.28 | 22.10 | 5.27 | 1.40 | 5.04 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125, 071 Btu/gal of gasoline. For example, in DOE Region 1, for electricity, $.085kWh = $24.82/1,000,000 Btu × 3,412 Btu/kWh.

## TABLE C–2.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 2]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy prices escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | | | | | | |
| | (Dollar per sales unit)[1] | (Dollar per $10^6$ Btu) | Mid-1985 (Dollars per $10^6$ Btu) | Mid-1990 (Dollars per $10^6$ Btu) | Mid-1995 (Per dollars $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .085(kWh) | 25.04 | 30.75 | 28.37 | 28.21 | 5.27 | −1.60 | −.11 |
| Distillate | 1.349 (gal) | 9.73 | 10.76 | 12.18 | 16.35 | 2.54 | 2.52 | [illegible] |
| LPG | .898 (gal) | 9.40 | 10.38 | 11.67 | 15.62 | 2.52 | 2.36 | 6.01 |
| Natural Gas | .005 ($ft^3$) | 5.25 | 7.37 | 7.82 | [illegible] | [illegible] | 1.18 | 2.12 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .082 (kWh) | [illegible] | 29.46 | 27.07 | [illegible] | [illegible] | −1.68 | −.12 |
| Distillate | 1.277 (gal) | 9.21 | 10.17 | 11.58 | 15.77 | [illegible] | 2.64 | [illegible] |
| Residual | .955 (gal) | 6.38 | [illegible] | 10.24 | 13.55 | [illegible] | [illegible] | 5.76 |
| Natural Gas | .005 ($ft^3$) | [illegible] | 6.57 | 7.01 | [illegible] | [illegible] | 1.32 | 2.35 |
| Steam Coal | 48.825 (ton) | 2.17 | 2.75 | 3.02 | 3.14 | [illegible] | 1.93 | .78 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .057 (kWh) | 16.76 | [illegible] | [illegible] | [illegible] | 5.29 | −2.42 | −.18 |
| Distillate | 1.273 (gal) | 9.18 | 10.14 | 11.56 | 15.74 | 2.53 | [illegible] | 6.37 |
| Residual | .968 (gal) | 6.47 | 9.14 | 10.38 | 13.69 | [illegible] | 2.59 | [illegible] |
| Natural Gas | .004 ($ft^3$) | 4.02 | [illegible] | [illegible] | [illegible] | 8.87 | 1.52 | 2.69 |
| Nat Gas MFBI | .006 ($ft^3$) | 6.11 | 8.58 | 9.75 | [illegible] | [illegible] | 2.57 | 5.75 |
| Steam Coal | 36.675 (ton) | 1.63 | 2.75 | 3.02 | 3.14 | 13.92 | 1.93 | .78 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.672 (gal) | 13.37 | 16.41 | 17.58 | 22.40 | 5.26 | 1.38 | 4.97 |

## TABLE C–3.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 3]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected Energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | | | | | | |
| | (Dollars per sales unit)[1] | (Dollars per $10^6$ Btu) | Mid-1985 (Dollars per $10^6$ Btu) | Mid-1990 (Dollars per $10^6$ Btu) | Mid-1995 (Dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .057 (kWh) | 16.77 | 20.61 | 21.29 | 21.43 | 5.29 | .65 | .12 |
| [illegible] | 1.345 (gal) | 9.70 | 10.71 | 12.13 | 16.32 | [illegible] | 2.53 | 6.10 |
| LPG | .933 (gal) | 9.77 | 10.79 | 12.07 | 16.03 | 2.52 | 2.27 | [illegible] |
| [illegible] | .004 ($ft^3$) | 4.37 | 6.14 | 6.97 | 7.90 | 8.87 | [illegible] | 2.55 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .056 (kWh) | 16.38 | 20.13 | [illegible] | 20.95 | [illegible] | [illegible] | .14 |
| Distillate | 1.283 (gal) | 9.25 | 10.22 | 11.65 | 15.84 | 2.51 | 2.67 | [illegible] |
| Residual | .997 (gal) | 6.66 | [illegible] | 10.65 | 13.96 | [illegible] | 2.52 | [illegible] |
| Natural Gas | .004 ($ft^3$) | 3.93 | 5.52 | 6.35 | 7.28 | [illegible] | [illegible] | 2.75 |
| Steam Coal | 41.400 (ton) | 1.84 | 2.33 | 2.61 | 2.73 | [illegible] | [illegible] | [illegible] |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .042 (kWh) | 12.22 | 15.01 | [illegible] | 15.83 | 5.28 | [illegible] | .18 |
| Distillate | 1.300 (gal) | 9.37 | 10.35 | 11.77 | 15.96 | 2.51 | [illegible] | [illegible] |
| Residual | .986 (gal) | [illegible] | 9.30 | 10.54 | [illegible] | 9.01 | [illegible] | 5.61 |
| Natural Gas | .004 ($ft^3$) | 3.52 | 4.95 | 5.79 | 6.73 | [illegible] | 3.18 | 3.04 |
| Nat Gas MFBI | .006 ($ft^3$) | [illegible] | 8.75 | 9.92 | 13.01 | [illegible] | 2.53 | 5.58 |
| Steam Coal | 31.050 (ton) | [illegible] | 2.33 | 2.61 | 2.73 | 13.94 | 2.36 | [illegible] |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.640 (gal) | 13.11 | 16.09 | 17.25 | 22.07 | 5.25 | 1.41 | 5.05 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DOE Region 1, for electricity, $.085/kWh=$24.82/1,000,000 Btu × 3,412 Btu/kWh.

## TABLE C-4.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 4]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy prices escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | Mid-1985 (dollars per $10^6$ Btu) | Mid-1990 (dollars per $10^6$ Btu) | Mid-1995 (dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| | (dollars per sales unit) [1] | (dollars per $10^6$ Btu) | | | | | | |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .046 (kWh) | 13.54 | 16.64 | 17.89 | 18.48 | 5.29 | 1.46 | .65 |
| Distillate | 1.324 (gal) | 9.55 | 10.55 | 11.98 | 16.20 | 2.52 | 2.57 | 6.22 |
| LPG | .933 (gal) | 9.77 | 10.79 | 12.07 | 16.03 | 2.52 | 2.27 | 5.83 |
| Natural Gas | .004 ($ft^3$) | 3.87 | 5.43 | 6.43 | 7.55 | 8.84 | 3.42 | 3.28 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .047 (kWh) | 13.90 | 17.07 | 18.31 | 18.90 | 5.28 | 1.41 | .63 |
| Distillate | 1.286 (gal) | 9.27 | 10.24 | 11.67 | 15.87 | 2.52 | 2.64 | 6.35 |
| Residual | .946 (gal) | 6.32 | 8.92 | 10.16 | 13.76 | 9.00 | 2.63 | 6.27 |
| Natural Gas | .003 ($ft.^3$) | 3.38 | 4.75 | 5.76 | 6.88 | 8.87 | 3.92 | 3.64 |
| Steam Coal | 59.625 (ton) | 2.65 | 3.36 | 3.88 | 3.90 | 6.09 | 2.96 | .06 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .036 (kWh) | 10.57 | 12.99 | 14.23 | 14.82 | 5.28 | 1.85 | .81 |
| Distillate | 1.300 (gal) | 9.37 | 10.35 | 11.77 | 15.99 | 2.51 | 2.62 | 6.32 |
| Residual | .942 (gal) | 6.29 | 8.87 | 10.12 | 13.73 | 8.98 | 2.66 | 5.29 |
| Natural Gas | .003 ($ft.^3$) | 2.96 | 4.16 | 5.16 | 6.26 | 8.88 | 4.38 | 4.03 |
| Nat. Gas MFBI | .006 ($ft.^3$) | 5.92 | 8.32 | 9.48 | 13.06 | 8.86 | 2.65 | 6.60 |
| Steam Coal | 45.000 (ton) | 2.00 | 3.36 | 3.88 | 3.90 | 13.82 | 2.96 | .06 |
| **TANSPORTATION** | | | | | | | | |
| Gasoline | 1.630 (gal) | 13.03 | 15.99 | 17.16 | 22.00 | 5.26 | 1.41 | 5.10 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DoE Region 1, for electricity, $.085/kWh=$24.82/1,000,000 Btu×3,412 Btu/kWh.

## TABLE C-5.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 5]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy prices escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | Mid-1985 (dollars per $10^6$ Btu) | Mid-1990 (dollars per $10^6$ Btu) | Mid-1995 (dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| | (Dollars per sales unit) [1] | (dollars per $10^6$ Btu) | | | | | | |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .55 (kWh) | 16.07 | 19.75 | 20.72 | 20.32 | 5.29 | .96 | −.38 |
| Distillate | 1.301 (gal) | 9.38 | 10.36 | 11.79 | 16.01 | 2.51 | 2.61 | 6.31 |
| LPG | .888 (gal) | 9.30 | 10.28 | 11.56 | 15.52 | 2.52 | 2.38 | 6.06 |
| Natural Gas | .004 ($ft^3$) | 4.16 | 5.84 | 6.33 | 7.30 | 8.85 | 1.63 | 2.90 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .053 (kWh) | 15.67 | 19.23 | 20.19 | 19.80 | 5.25 | .98 | −.40 |
| Distillate | 1.241 (gal) | 8.95 | 9.89 | 11.32 | 15.53 | 2.53 | 2.73 | 6.53 |
| Residual | .946 (gal) | 6.32 | 8.92 | 10.16 | 6.95 | 9.00 | 2.68 | −7.34 |
| Natural Gas | .004 ($ft^3$) | 3.84 | 5.40 | 5.89 | 6.86 | 8.87 | 1.76 | 3.10 |
| Steam Coal | 42.975 (ton) | 1.91 | 2.42 | 2.67 | 2.70 | 5.12 | 2.00 | .18 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .039 (kWh) | 11.50 | 14.14 | 15.10 | 14.70 | 5.30 | 1.32 | −.53 |
| Distillate | 1.241 (gal) | 8.95 | 9.88 | 11.32 | 15.53 | 2.50 | 2.76 | 6.53 |
| Residual | .942 (gal) | 6.29 | 8.88 | 10.16 | 6.93 | 9.02 | 2.71 | −7.36 |
| Natural Gas | .004 ($ft^3$) | 3.53 | 4.96 | 5.46 | 6.41 | 8.90 | 1.91 | 3.29 |
| Natural Gas MFBI | .006 ($ft^3$) | 5.92 | 8.32 | 9.52 | 6.41 | 8.88 | 2.73 | −7.59 |
| Steam Coal | 32.400 (ton) | 1.44 | 2.42 | 2.67 | 2.70 | 13.88 | 2.00 | .18 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.622 (gal) | 12.97 | 15.92 | 17.09 | 21.93 | 5.26 | 1.42 | 5.12 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a millio-n and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DOE Region 1, for electricity, $0.85/kWh=$24.82/1,000,000 Btu×3,412 Btu/kWh.

## TABLE C–6.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 6]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy prices escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | Mid-1985 | Mid-1990 | Mid-1995 | | | |
| | (Dollars per sales unit)[1] | (Dollars per $10^6$ Btu) | (dollars per $10^6$ Btu) | (dollars per $10^6$ Btu) | (dollars per $10^6$ Btu) | Mid-1981–Mid-1985 | Mid-1985–Mid-1990 | Mid-1990–Mid-1995 and beyond |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .067 (kWh) | 19.58 | 24.05 | 24.33 | 24.92 | 5.26 | .23 | .48 |
| Distillate | 1.338 (gal) | 9.65 | 10.66 | 12.09 | 16.31 | 2.52 | 2.54 | 6.17 |
| LPG | .887 (gal) | 9.29 | 10.26 | 11.55 | 15.50 | 2.52 | 2.38 | 6.07 |
| Natural Gas | .004 ($ft^3$) | 4.18 | 5.88 | 5.86 | 6.58 | 8.88 | –.04 | 2.34 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .063 (kWh) | 18.56 | 22.79 | 23.06 | 23.66 | 5.27 | .23 | .51 |
| Distillate | 1.265 (gal) | 9.12 | 10.07 | 11.51 | 15.73 | 2.51 | 2.71 | 6.45 |
| Residual | .948 (gal) | 6.33 | 8.93 | 10.19 | 13.86 | 8.99 | 2.67 | 6.34 |
| Natural Gas | .004 ($ft^3$) | 3.67 | 5.16 | 5.14 | 5.88 | 8.87 | –.05 | 2.69 |
| Steam Coal | 59.850 (ton) | 2.66 | 3.37 | 3.62 | 3.90 | 6.09 | 1.45 | 1.48 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .052 (kWh) | 15.30 | 18.79 | 19.05 | 19.64 | 5.27 | .28 | .61 |
| Distillate | 1.261 (gal) | 9.09 | 10.05 | 11.49 | 15.71 | 2.54 | 2.71 | 6.46 |
| Residual | .946 (gal) | 6.32 | 8.92 | 10.18 | 13.85 | 9.00 | 2.68 | 6.35 |
| Natural Gas | .003 ($ft^3$) | 3.39 | 4.76 | 4.76 | 5.46 | 8.86 | .00 | 2.85 |
| Nat Gas MFBI | .003 ($ft^3$) | 3.39 | 4.76 | 4.76 | 5.46 | 8.86 | .00 | 2.85 |
| Steam Coal | 45.000 (ton) | 2.00 | 3.37 | 3.62 | 3.90 | 13.93 | 1.45 | 1.48 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.600 (gal) | 12.79 | 15.71 | 16.87 | 21.73 | 5.27 | 1.44 | 5.19 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DoE Region 1, for electricity, $.085/kWh=$24.82/1,000,000 BtuX3,412 Btu/kWh.

## TABLE C–7.—Energy Prices and Escalation Rates

[DOE Region 7]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base year | | Mid-1985 | Mid-1990 | Mid-1995 | | | |
| | (Dollars per Sales Unit)[1] | (Dollars per $10^6$ Btu) | (Dollars per $10^6$ Btu) | (Dollars per $10^6$ Btu) | (Dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .060 (kWh) | 17.45 | 21.45 | 19.88 | 21.01 | 5.30 | –1.51 | 1.11 |
| Distillate | 1.280 (gal) | 9.23 | 10.20 | 11.63 | 15.85 | 2.54 | 2.65 | 6.39 |
| LPG | .883 (gal) | 9.25 | 10.22 | 11.50 | 15.46 | 2.51 | 2.39 | 6.09 |
| Nautral Gas | .004 ($ft^3$) | 3.76 | 5.29 | 6.01 | 6.85 | 8.90 | 2.58 | 2.65 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .057 (kWh) | 16.57 | 20.36 | 18.79 | 19.92 | 5.28 | –1.59 | 1.17 |
| Distillate | 1.233 (gal) | 8.89 | 9.82 | 11.26 | 15.48 | 2.52 | 2.77 | 6.57 |
| Residual | .952 (gal) | 6.36 | 8.97 | 10.24 | 7.06 | 8.97 | 2.69 | –7.16 |
| Natural Gas | .003 ($ft^3$) | 3.38 | 4.74 | 5.47 | 6.31 | 8.80 | 2.91 | 2.90 |
| Steam Coal | 36.675 (ton) | 1.63 | 2.06 | 2.28 | 2.36 | 6.06 | 2.01 | .73 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .046 (kWh) | 13.41 | 16.47 | 14.90 | 16.04 | 5.28 | –1.96 | 1.48 |
| Distillate | 1.232 (gal) | 8.88 | 9.81 | 11.25 | 15.47 | 2.52 | 2.78 | 6.58 |
| Residual | .946 (gal) | 6.32 | 8.93 | 10.20 | 7.03 | 9.03 | 2.70 | –7.19 |
| Natural Gas | .003 ($ft^3$) | 3.04 | 4.27 | 5.00 | 5.84 | 8.86 | 3.21 | 3.15 |
| Nat Gas MFBI | .006 ($ft^3$) | 5.96 | 8.37 | 9.57 | 6.26 | 8.86 | 2.71 | –8.14 |
| Steam Coal | 27.675 (ton) | 1.23 | 2.06 | 2.28 | 2.36 | 13.79 | 2.01 | .73 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.608 (gal) | 12.86 | 15.80 | 16.97 | 21.82 | 5.29 | 1.43 | 5.16 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gas of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DOE Region 1, for electricity, $.085kWh=$24.82/1,000,000 Btu × 3,412 Btu/kWh.

## TABLE C–8.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 8]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | Mid-1985 (Dollars per $10^6$ Btu) | Mid-1990 (Dollars per $10^6$ Btu) | Mid-1995 (Dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| | (Dollars per sales unit) [1] | (Dollars per $10^6$ Btu) | | | | | | |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .056 (kWh) | 16.35 | 20.10 | 16.50 | 14.12 | 5.29 | −3.87 | −3.06 |
| Distillate | 1.315 (gal) | 9.48 | 10.48 | 11.86 | 16.14 | 2.54 | 2.54 | 6.31 |
| LPG | .902 (gal) | 9.44 | 10.43 | 11.71 | 15.67 | 2.53 | 2.35 | 5.99 |
| Natural Gas | .004 ($ft^3$) | 4.00 | 5.62 | 5.62 | 6.09 | 8.89 | .00 | 1.61 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .052 (kWh) | 15.12 | 18.57 | 14.98 | 12.61 | 5.28 | −4.21 | −3.37 |
| Distillate | 1.240 (gal) | 8.94 | 9.88 | 11.28 | 15.54 | 2.53 | 2.69 | 6.61 |
| Residual | .926 (gal) | 6.20 | 6.75 | 9.99 | 13.69 | 9.00 | 2.67 | 6.51 |
| Natural Gas | .004 ($ft^3$) | 3.78 | 5.31 | 5.32 | 5.79 | 8.88 | .06 | 1.70 |
| Steam Coal | 29.025 (ton) | 1.29 | 1.63 | 1.63 | 1.68 | 6.03 | .00 | .58 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .038 (kWh) | 11.21 | 13.78 | 10.17 | 7.82 | 5.29 | −5.89 | −5.12 |
| Distillate | 1.247 (gal) | 8.99 | 9.93 | 11.33 | 15.59 | 2.51 | 2.68 | 6.59 |
| Residual | .921 (gal) | 6.15 | 6.68 | 9.92 | 13.62 | 9.00 | 2.70 | 6.56 |
| Natural Gas | .003 ($ft^3$) | 3.33 | 4.68 | 4.69 | 5.16 | 8.86 | .05 | 1.92 |
| Nat Gas MFBI | .003 ($ft^3$) | 3.33 | 4.68 | 4.71 | 5.16 | 8.86 | .15 | 1.82 |
| Steam Coal | 21.625 (ton) | .97 | 1.63 | 1.63 | 1.68 | 13.87 | .00 | .58 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.606 (gal) | 12.84 | 15.77 | 16.88 | 21.77 | 5.27 | 1.38 | 5.22 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DOE Region 1, for electricity, $.065/kWh=$24.82/1,000,000 Btu × 3,412 Btu/kWh.

## TABLE C–9.—ENERGY PRICES AND ESCALATION RATES

[DOE Region 9]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | Mid-1985 (Dollars per $10^6$ Btu) | Mid-1990 (Dollars per $10^6$ Btu) | Mid-1995 (Dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| | (Dollars per sales unit [1] | (Dollars per $10^6$ Btu) | | | | | | |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .064(kWh) | 18.81 | 23.10 | 22.59 | 21.73 | 5.28 | −.45 | −.78 |
| Distillate | 1.283 (gal) | 9.25 | 10.22 | 11.64 | 15.81 | 2.51 | 2.65 | 6.32 |
| LPG | .889 (gal) | 9.31 | 10.29 | 11.57 | 15.53 | 2.53 | 2.38 | 6.06 |
| Natural Gas | .005 ($ft^3$) | 5.11 | 7.18 | 6.95 | 7.24 | 8.88 | −.64 | .81 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .068 (kWh) | 19.84 | 24.38 | 23.86 | 23.00 | 5.28 | −.43 | −.73 |
| Distillate | 1.200 (gal) | 8.65 | 9.56 | 10.99 | 15.17 | 2.52 | 2.84 | 6.65 |
| Residual | .904 (gal) | 6.04 | 6.52 | 9.78 | 13.40 | 9.00 | 2.79 | 6.50 |
| Natural Gas | .005 ($ft^3$) | 4.62 | 6.49 | 6.26 | 6.55 | 8.85 | −.71 | .90 |
| Steam Coal | 62.775 (ton) | 2.79 | 3.54 | 3.78 | 3.78 | 6.11 | 1.32 | .00 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .055 (kWh) | 16.11 | 19.80 | 19.28 | 18.42 | 5.29 | −.53 | −.91 |
| Distillate | 1.200 (gal) | 8.65 | 9.56 | 10.99 | 15.17 | 2.52 | 2.84 | 6.65 |
| Residual | .903 (gal) | 6.03 | 6.51 | 9.77 | 13.40 | 9.00 | 2.80 | 6.53 |
| Natural Gas | .004 ($ft^3$) | 4.25 | 5.97 | 5.74 | 6.03 | 8.87 | −.77 | .98 |
| Nat Gas MFBI | .006 ($ft^3$) | 5.66 | 7.95 | 9.15 | 12.88 | 8.86 | 2.85 | 7.08 |
| Steam Coal | 47.250 (ton) | 2.10 | 3.54 | 3.78 | 3.78 | 13.92 | 1.32 | .00 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.600 (gal) | 12.79 | 15.69 | 16.88 | 21.68 | 5.25 | 1.47 | 5.13 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 138,690 Btu/gal of distillate; 95,500 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DOE Region 1, for electricity, $.065/kWh=$24.82/1,000,000 BtuX3,412 Btu/kWh.

## TABLE C–10.—Energy Prices and Escalation Rates

[DOE Region 10]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base year | | Mid-1985 | Mid-1990 | Mid-1995 | | | |
| | (Dollars per Sales Unit) [1] | (Dollars per $10^6$ Btu) | (Dollars per $10^6$ Btu) | (Dollars per $10^6$ Btu) | (Dollars per $10^6$ Btu) | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .024 (kWh) | 7.16 | 8.80 | 10.59 | 9.90 | 5.29 | 3.77 | .33 |
| Distillate | 1.276 (gal) | 9.20 | 10.17 | 11.59 | 15.77 | 2.53 | 2.66 | 6.34 |
| LPG | .889 (gal) | 9.31 | 10.29 | 11.57 | 15.53 | 2.53 | 2.38 | 6.06 |
| Natural Gas | .007 ($ft^3$) | 5.90 | 9.69 | 8.00 | 7.81 | 8.85 | −3.76 | −.48 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .024 (kWh) | 6.96 | 8.55 | 10.35 | 9.65 | 5.27 | 3.89 | −1.38 |
| Distillate | 1.200 (gal) | 8.65 | 9.56 | 10.99 | 15.17 | 2.52 | 2.84 | 6.65 |
| Residual | .880 (gal) | 5.88 | 8.30 | 9.56 | 13.18 | 8.99 | 2.87 | 6.64 |
| Natural Gas | .006 ($ft^3$) | 6.34 | 8.91 | 7.22 | 7.01 | 8.88 | −4.12 | −.57 |
| Steam Coal | 40.500 (ton) | 1.80 | 2.28 | 3.27 | 3.47 | 6.07 | 7.52 | 1.15 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .012 (kWh) | 3.62 | 4.45 | 6.25 | 5.56 | 5.29 | 7.03 | −2.29 |
| Distillate | 1.200 (gal) | 8.65 | 9.56 | 10.99 | 15.17 | 2.52 | 2.84 | 6.65 |
| Residual | .897 (gal) | 5.99 | 8.45 | 9.71 | 13.34 | 8.99 | 2.82 | 6.56 |
| Natural Gas | .006 ($ft^3$) | 5.69 | 8.00 | 6.31 | 6.10 | 8.88 | −4.64 | −.65 |
| Nat Gas MFBI | .006 ($ft^3$) | 5.69 | 8.00 | 9.09 | 12.82 | 8.88 | 2.59 | 7.12 |
| Steam Coal | 30.600 (ton) | 1.36 | 2.28 | 3.27 | 3.47 | 13.76 | 7.52 | 1.15 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.601 (gal) | 12.80 | 15.72 | 18.89 | 21.70 | 5.27 | 1.45 | 5.14 |

## TABLE C–11.—Energy Prices and Escalation Rates

[United States Average]

| Fuel type | Current and projected energy prices (in mid-1981 dollars) | | | | | Projected energy price escalation rates (percentage change compounded annually) | | |
|---|---|---|---|---|---|---|---|---|
| | Mid-1981 base-year | | Mid-1985 (Dollars per $10^6$ Btu | Mid-1990 (Dollars per $10^6$ Btu) | Mid-1995 (Dollars per $10^6$ Btu) | | | |
| | (Dollars per Sales Unit) [1] | (Dollars per $10^6$ Btu) | | | | Mid-1981–mid-1985 | Mid-1985–mid-1990 | Mid-1990–mid-1995 and beyond |
| **RESIDENTIAL SECTOR** | | | | | | | | |
| Electricity | .057 (kWh) | 16.74 | 20.56 | 20.81 | 20.62 | 5.28 | .24 | −.19 |
| Distillate | 1.334 (gal) | 9.62 | 10.62 | 12.05 | 16.25 | 2.51 | 2.55 | 6.16 |
| LPG | .900 (gal) | 9.42 | 10.41 | 11.69 | 15.65 | 2.52 | 2.35 | 6.00 |
| Natural Gas | .004 ($ft^3$) | 4.42 | 6.21 | 6.62 | 7.45 | 8.88 | 1.28 | 2.38 |
| **COMMERCIAL SECTOR** | | | | | | | | |
| Electricity | .058 (kWh) | 17.10 | 21.01 | 21.10 | 20.88 | 5.28 | .09 | −.23 |
| Distillate | 1.262 (gal) | 9.10 | 10.05 | 11.47 | 15.66 | 2.51 | 2.69 | 6.42 |
| Residual | .949 (gal) | 6.34 | 8.94 | 10.19 | 12.29 | 8.99 | 2.64 | 3.82 |
| Natural Gas | .004 ($ft^3$) | 3.98 | 5.59 | 6.01 | 6.82 | 8.85 | 1.46 | 2.58 |
| Steam Coal | 39.375 (ton) | 1.75 | 2.22 | 2.42 | 2.49 | 6.11 | 1.77 | .59 |
| **INDUSTRIAL SECTOR** | | | | | | | | |
| Electricity | .042 (kWh) | 12.32 | 15.13 | 15.56 | 15.48 | 5.27 | .58 | −.12 |
| Distillate | 1.266 (gal) | 9.13 | 10.08 | 11.50 | 15.69 | 2.51 | 2.66 | 6.42 |
| Residual | .949 (gal) | 6.34 | 8.96 | 10.13 | 10.92 | 9.02 | 2.50 | 1.52 |
| Natural Gas | .004 ($ft^3$) | 3.52 | 4.94 | 5.12 | 5.89 | 8.84 | .72 | 2.83 |
| Nat Gas MFBI | .005 ($ft^3$) | 4.52 | 6.35 | 5.10 | 5.83 | 8.89 | −4.32 | 2.72 |
| Steam Coal | 37.800 (ton) | 1.68 | 2.82 | 3.19 | 3.35 | 13.80 | 2.51 | .96 |
| **TRANSPORTATION** | | | | | | | | |
| Gasoline | 1.622 (gal) | 12.97 | 15.92 | 17.99 | 21.92 | 5.26 | 1.42 | 5.11 |

[1] Note that these prices are equivalent to those in the adjacent col. (both for mid-1981), but they are stated in different units of energy. Price per sales unit of energy is derived from price per million Btu by dividing the price by a million and multiplying by the Btu content of a sales unit of energy, assuming the following Btu content per sales unit of energy: 3,412 Btu/kWh of electricity; 136,690 Btu/gal of distillate; 95,800 Btu/gal of LPG; 1,016 Btu/$ft^3$ of natural gas; 149,690 Btu/gal of residual; 22,500,000 Btu/ton of steam coal; and 125,071 Btu/gal of gasoline. For example, in DoE Region 1, for electricity, $.095/kWh=$24.92/1,000,000 Btu X 3,412 Btu/kWh.

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